PERIODICAL ROOM
GENERAL LIBRARY
UNIV. OF MICH

MAR 22 1945

Review of Educational Research

VOL. XV, No. 1 FEBRUARY 1945

SCHOOL PLANT AND EQUIPMENT

AMERICAN EDUCATIONAL RESEARCH ASSOCIATION

A Department of the

NATIONAL EDUCATION ASSOCIATION OF THE UNITED STATES

1201 Sixteenth St., N.W., Washington 6, D. C.

AMERICAN EDUCATIONAL RESEARCH ASSOCIATION

THIS ASSOCIATION is composed of persons engaged in technical research in education, including directors of research in school systems, instructors in educational institutions, and research workers connected with private educational agencies.

Officers, February 1944–February 1945

President: J. WAYNE WRIGHTSTONE, Public Schools, New York, N. Y.

Vicepresident: ALVIN C. EURICH, Commander, U. S. N. R., Officer in Charge of Standards and Curriculum, Bureau of Naval Personnel, Washington, D. C.

Secretary-Treasurer: DAVID SEGEL, U. S. Office of Education, Washington, D. C.

Executive Committee

Consists of five members: president, vicepresident, secretary-treasurer, the chairman of the Editorial Board, and the immediate past-president: NEWTON EDWARDS, University of Chicago, Chicago, Ill.

Editorial Board

J. CAYCE MORRISON, *Chairman and Editor*, New York State Education Department, Albany, N. Y.

ARNOLD E. JOYAL, *Associate Editor*, University of Maryland, College Park, Md.

PAUL R. HANNA, Professor of Education, Stanford University, Calif.

The president and secretary-treasurer, ex officio.

Applications for membership should be sent to the secretary-treasurer. Upon approval by the Executive Committee persons applying will be invited to become members.

Subscriptions to the REVIEW should be sent to the secretary-treasurer (note address above).

Orders for one or more publications, accompanied by funds in payment, should be sent to the American Educational Research Association, 1201 Sixteenth St., N. W., Washington 6, D. C. For a list of titles see the back inside cover page.

Active members of the Association pay dues of $5 per year. Of this amount $4 is for subscription to the REVIEW. The REVIEW is published in February, April, June, October, and December.

Entered as second-class matter April 10, 1931, at the post office at Washington, D. C., under the Act of August 24, 1912.

Education
Direct

REVIEW OF EDUCATIONAL RESEARCH

Official Publication of the American Educational Research Association. Contents are listed in the Education Index.

Copyright, 1945
By National Education Association of the United States, Washington, D. C.

Vol. XV, No. 1 **February 1945**

School Plant and Equipment

Reviews the literature for the three-year period since the issuance of Volume XII, No. 2, April 1942.

TABLE OF CONTENTS

Chapter *Page*

Foreword 4

Introduction 5

I. Social Significance of the School Plant 6
JOSEPH SEIDLIN, *Alfred University, Alfred, New York*

II. Procedures for Determining School Plant Needs 10
WILLIAM K. WILSON, *State Education Department, Albany, New York*

III. The School Plant as An Educational Instrument 13
CHARLES W. BURSCH, *State Department of Education, Sacramento, California*

IV. Staff Participation in Plant Planning 18
HAROLD E. CHASTAIN, *Placer High School and Junior College, Auburn, California*

V. Wartime School Plant Facilities 24
ANDREW H. GIBBS, *U. S. Office of Education, Washington, D. C.*

VI. Plant Facilities for Vocational Education 29
WARD P. BEARD, *U. S. Office of Education, Washington, D. C.*

VII. Plant Facilities for Higher Education 34
E. T. PETERSON, *State University of Iowa, Iowa City, Iowa*

VIII. School Plant Lighting 41
CHARLES D. GIBSON, *State Department of Education, Los Angeles, California*

IX. Heating and Ventilating the School Building 51
PAUL W. SEAGERS, *Cato-Meridian Central School, Cato, New York*

Chapter *Page*

X. Trend in Materials and Design 54
REGINALD E. MARSH, *Tooker and Marsh, Architects, New York, New York*

XI. School Plant Operation 61
HENRY H. LINN and CLEVE O. WESTBY, *Teachers College, Columbia University, New York, New York*

XII. School Plant Insurance 71
NELSON E. VILES, *War Relocation Authority, Washington, D. C.*

XIII. Financial Aspects of the School Plant 77
WILLIAM R. FLESHER, *Ohio State University, Columbus, Ohio*

XIV. Legal Aspects of the School Plant 83
JOHN H. HERRICK, *Public Schools, Cincinnati, Ohio*

Index 92

This issue of the REVIEW was prepared by
the Committee on School Plant and Equipment

RAY L. HAMON, *Chairman*, U. S. Office of Education, Washington, D. C.

CHARLES W. BURSCH, State Department of Education, Sacramento, California

JOHN H. HERRICK, Public Schools, Cincinnati, Ohio

REGINALD E. MARSH, TOOKER and MARSH, Architects, New York, New York

NELSON E. VILES, War Relocation Authority, Washington, D. C.

WILLIAM K. WILSON, State Education Department, Albany, New York

with the assistance of

WARD P. BEARD, U. S. Office of Education, Washington, D. C.

HAROLD E. CHASTAIN, Placer High School and Junior College, Auburn, California

WILLIAM R. FLESHER, Ohio State University, Columbus, Ohio

ANDREW H. GIBBS, U. S. Office of Education, Washington, D. C.

CHARLES D. GIBSON, State Department of Education, Los Angeles, California

HENRY H. LINN, Teachers College, Columbia University, New York, New York

E. T. PETERSON, State University of Iowa, Iowa City, Iowa

PAUL W. SEAGERS, Cato-Meridian Central School, Cato, New York

JOSEPH SEIDLIN, Alfred University, Alfred, New York

CLEVE O. WESTBY, Teachers College, Columbia University, New York, New York

FOREWORD

THE VALUE OF THIS ISSUE of the REVIEW may be inversely proportional to the amount of research conducted in this field during the past three years. For more than four years school building construction has been nearly at a standstill in the United States. There is some evidence that the need for new construction is accelerated with each year the war continues. When the war ends, there will be such a backlog of need for new school building as has not been witnessed in any previous period in the history of American education.

The contributors to this issue of the REVIEW make it clear that we cannot be satisfied with the kind of school building we have heretofore accepted, good as much of it was. New buildings must be adapted to the changing purposes and methods of instruction. They must be centers for fostering human relationships and social intercourse not only of children but of persons of all ages. Research suggests new standards for ventilating, lighting, heating, materials, and design.

More than in most issues of the REVIEW the Committee on School Plant and Equipment has stressed the research that is needed if the great volume of school building construction needed after the war is adequately to serve the ongoing progress of education.

J. CAYCE MORRISON
Chairman of the Editorial Board

INTRODUCTION

THIS IS THE FIFTH NUMBER of the REVIEW OF EDUCATIONAL RESEARCH dealing with the school plant and equipment. The four previous numbers covering this area were published in December 1932, October 1935, October 1938, and April 1942.

This volume has been prepared thru the overtime efforts of contributors who were already heavily loaded with additional wartime responsibilities. Curtailment in building activity has greatly reduced the volume of research in this field, altho extensive research and planning preparatory to a postwar school building program should be under way.

The Committee has included in this number many authoritative articles by experienced school plant specialists, because it is believed they are as significant for the guidance of school administrators and architects as much of the more objective research by less experienced authors.

In general the Committee has followed the organization of the four previous numbers in the school plant series but it seemed advisable to make a few changes. This number includes a chapter on "Plant Facilities for Higher Education," covering the period since the 1938 number. "School Plant Insurance" has in the past been treated under various chapters in the different series of the REVIEW. The Committee considers that this is a school plant topic and has given it a chapter in this number. The field of pupil transportation has been treated in some of the earlier school plant numbers, but that topic was omitted from this number because it was covered in the April 1944 number on "Finance and Business Administration." Because of present emphasis on vocational education and audio-visual aids, the Committee has devoted a chapter in this number to each of these topics. This number was originally planned for division into six major parts but the final materials did not seem to fit logically into such an organization.

RAY L. HAMON, *Chairman*
Committee on School Plant and Equipment

CHAPTER I

Social Significance of the School Plant

JOSEPH SEIDLIN

WE HAVE TRAVELED a long way from the somewhat mythical and wholly sentimental "log" that was the school plant for Mark Hopkins and his more or less fortunate pupil; but not until very recently have any significant attempts been made to provide the right kind of "mansion" of education for society's ever-expanding "house." It seems altogether likely that a high correlation exists between the character of the school plant and the all-round usefulness of the school plant to the community.

An increasing number of studies, ranging from the armchair variety to a few that bear some semblance to scientific investigation, are concerned with suggesting or determining those characteristics of a school plant which are most likely to make it at once the most efficient schoolhouse and the most effective community center.

It does seem, however, that the early stages of pioneering in whatever has thus far passed for research in this area are over. It is time that workers in the field and researchers in the neighboring fields were made aware of the meaning of research in school plants and equipment.

It does not matter a great deal how social scientists define research (save, perhaps, in some way that least offends the physical scientists), so there cease to be many unwarranted claims to scientific validity of pseudoscientific or nonscientific "studies" and much apologizing on the part of reviewers. In many of the former issues of the REVIEW one finds the expression "actual research." Since one does not know what is meant by research, "actual" helps matters not at all. Social progress may or may not depend on research, experimentation, or a scientific attitude. There are those "in high places" who believe that a Sinclair Lewis, passing thru Main Street of Middletown at twenty-five miles per hour, is capable of learning and telling as much about "life" in Middletown as a heavily staffed research group after two years of hyperscientific study. Even if this were so, some kind of research would be needed to separate the Sinclair Lewises from those who pose as or pass for Sinclair Lewises.

The bibliography for this chapter includes a variety of published material which bears on the social significance of the school plant. Most of the material is suggestive of and excellent preparation for an approaching period of controlled experimentation and research.

The School Plant Covers More Ground

The phase of "sufficient school plant acreage for playgrounds" has been passed. That much has been generally accepted and is determined by law in some states. It is a long step ahead claimed by Engelhardt (5) that "in the high schools, part of the instruction of every youth will be

lessons in automobile driving for which driving grounds will be needed. The high schools may be expected to give flying training in low-powered planes—for this alone a minimum of 320 acres is essential. . . ." To obviate the criticism of impracticality, Engelhardt (7) elsewhere suggested that "the future school plant may be widely scattered, the camp in the mountains, the ship at the shore, the airport, and the farm at the outskirts."

The School Buildings to Serve More and More Varied Purposes

Leevy (12) suggested that the utility of high schools, even in small communities, may be expanded to include adult educational meetings, the scheduling of school events in cooperation with interest groups, and the sharing of the school library with the public. In this connection, Englehardt (6) warned boards of education especially that new building programs dare not neglect "the impact of this war upon the educational needs of our people." Seman (19) declared that the school buildings of the future will need to be the "beacon of the Community . . . the center in which the real needs of the people will be met." Several such or nearly such model schools are already in existence. Powell (17) found that such schools, as the Henry E. Huntington School of San Marino, California, serve at once as "town hall, lecture room, little theater, music hall, community dance pavilion, library, boy or girl scout cabin, and, more recently, war-work center." More moderately, Moehlman (15) claimed that the physical facilities for youth and adult educational activities "tend to supplement each other to such an astonishing degree that the provision for dual facilities within the secondary plant should not be considered either difficult or expensive." Finally, Lescaze (13) contended that the realization that generally "our school buildings are inferior to our educational programs" will spur us on to better planned and better designed school buildings.

Availability of School Plants for General Community Uses

West (21) gave a detailed description of the rules and regulations governing the use of school buildings for community purposes in Long Branch, New Jersey. It would appear to be the most extensive use of the school plant on record. Chambers (2) analyzed the problem of using school property for extra school (community, civic, and recreational) uses as still "lively" and productive of disagreements and court actions. In the case of the Detroit schools (18) the use of school buildings was established on a basis of cooperation between the board of education and the department of parks and recreation. Based on an earlier survey, Grieder (8) reported "no conflict between community and school use of the school plant." In fact, in the state of Colorado there is "a complete absence in the school laws of any regulative measures pertaining to school building use." The National Recreation Association (16) in cooperation with the American Association of School Administrators issued a leaflet outlining basic plans

and offering suggestions for the use of school buildings for community recreation.

Community Centered Schools and School Centered Communities

Hecht (10) found that generally our schools are not "being used to the full measure of their capacity." He recommended investigation of the possible kinds of interaction between the school and the community. Moehlman (15) emphasized that the community centered school offers the the best opportunity for the people to exercise their fundamental right to participate as partners. . . . Hanson (9) recommended that school buildings should be built where the children are and with an understanding of "educational function." Clark (3) in a summary of a group of experiments on school centered communities concluded that ". . . within the limits of our Experimental Evidence the schools can change a Community."

Children Live As Well As Learn in School Buildings

Mock (14) stressed the planning of school buildings from the point of view of the children who will use them. There must be established "a sympathetic relationship between buildings and children." In much the same vein Holmes and Shigley (11) emphasized that the school plant "molds our children's tastes and opinions." Washburne (20) described the Crow Island School in Winnetka as a building planned by "the coordinated thinking of children, teachers, supervisors. . . ." The building is not "too beautiful"; it is, in short, for children's use. The extreme of building use by children was demonstrated by Kaiser's Child Service Centers serving the Portland shipyards (1). These might not survive the war. Dotter (4) developed a score card for school plants in which he regards site, building, classrooms, special classrooms, general service rooms, administrative rooms, and service systems as the seven major factors. The total number of subdivisions is fifty-one, and in all, a list of over 1300 factors was developed.

Needed Research

There is a clear-cut trend in both thought and observation, as well as some incomplete experimentation, toward further inquiry and research in the following two areas of school-community interrelationship:

1. What are the limits of the differential between the nature and the quality of the school plant and the nature and the quality of the community homes for maximal influence of the school plant on the tastes, desires, and "behavior" of the community?

2. How may parents (and nonparent taxpayers) be made to feel that the school plant belongs to them? And, reciprocally, how may the staff of the school plant be made to feel that the community at large is the enlarged population of the school plant?

Bibliography

1. ARCHITECTURAL RECORD. "Designed for Twenty-four Hour Child Care." *Architectural Record* 95: 84-88; March 1944.
2. CHAMBERS, MERRITT M. "When the Public Uses Schools for Civic and Welfare Purposes." *Nations Schools* 29: 30-31; June 1942.
3. CLARK, HAROLD F. "Schools Can Change a Community." *Teachers College Record* 44: 408-16; March 1943.
4. DOTTER, A. D. "A Score Card for School Plants Accommodating Both Elementary and Secondary Grades." *American School and University*. New York: American School Publishing Corp., 1942. p. 41-48.
5. ENGELHARDT, NICKOLAUS L. "An Analysis of Planning for Post-War School Construction." *American School and University*. New York: American School Publishing Corp., 1943. p. 11-16.
6. ENGELHARDT, NICKOLAUS L. "Community Schools for Democracy." *Teachers College Record* 44: 181-86; December 1942.
7. ENGELHARDT, NICKOLAUS L. "The Impact of the War upon School Building Planning." *American School and University*. New York: American School Publishing Corp., 1942. p. 13-20.
8. GRIEDER, CALVIN. "Colorado's Open Door Policy." *School Executive* 61: 21-22; August 1942.
9. HANSON, ABEL A. "Planning Now for Postwar Buildings in Elmont—II." *American School Board Journal* 106: 35-38; March 1943.
10. HECHT, GEORGE J. "Open the Doors of Our Schools." *Parents Magazine* 18: 15; December 1943.
11. HOLMES, WARREN S., and SHIGLEY, ARTHUR R. "A School Building Planned Around the Educational Program." *American School and University*. New York: American School Publishing Corp., 1943. p. 43-46.
12. LEEVY, JOHN R. "Make Wider Use of Your Building." *Nation's Schools* 29: 17; April 1942.
13. LESCAZE, WILLIAM. "Types of Schools to Serve Tomorrow's Needs." *American School and University*. New York: American School Publishing Corp., 1943. p. 33-36.
14. MOCK, ELIZABETH B. "Schools Are For Children." *American School and University*. New York: American School Publishing Corp., 1943. p. 37-42.
15. MOEHLMAN, ARTHUR B. "Community-Centered Secondary Schools." *Nation's Schools* 29: 18-19; January 1942.
16. NATIONAL RECREATION ASSOCIATION. *Planning School Buildings for Community Recreation Use*. New York: National Recreation Association, 1944.
17. POWELL, HERBERT J. "Community Will Use Tomorrow's Schools." *American School and University*. New York: American School Publishing Corp., 1943. p. 22-25.
18. RECREATION. "When Schools Are Used as Community Centers." *Recreation* 36: 511-17; December 1942.
19. SEMAN, PHILLIP L. "Wiser Use of the School Plant." *Recreation* 35: 711-14; March 1942.
20. WASHBURNE, CARLETON W. "Crow Island School—In Winnetka." *American School and University*. New York: American School Publishing Corp., 1942. p. 62-66.
21. WEST, HAROLD N. "Use of Schools After School Hours." *School Executive* 62: 18-19; November 1942.

CHAPTER II

Procedures for Determining School Plant Needs

WILLIAM K. WILSON

THE ONLY REASON for the existence of a school building is that it is needed to house an educational program. The determination of need for school plant facilities is a local educational problem, whether the area referred to as "local" is the small rural district or the large city system. The problem of determining school plant needs on the local level may be simple or complex, requiring in the latter case careful and objective survey work that in some details may involve considerable research.

The school plant survey or long-range school plant planning study is concerned primarily with the problem of determining what new buildings are or will be needed, what old ones should be remodeled and continued in use, which ones should be continued as they are, and which ones should be abandoned. These questions are related very closely to enrolment trends, both numerical and locational; to population trends; to conditions of the local school plant; and to educational organization and administration. The need for research is involved in the accurate and reliable prediction of population and enrolment trends as they affect the determination of school plant needs. Detailed planning and financing, while a part of the complete school plant survey, are not specifically part of the problem of determining needs, but they are involved in the problem of meeting the needs as determined.

Three school plant surveys are listed that illustrate technics of research used in determining school plant needs on the local level. In the Minneapolis School Survey, Holy (3) studied the location of all seventh-, eighth-, and ninth-grade pupils in relation to the junior high-school buildings and made recommendations toward the transfer of certain pupils from elementary buildings to junior high schools. Holy also determined objectively, thru an area study of the distribution of elementary children, that of eighty-five elementary schools in the city, twenty-one, including two portables, could be closed without denying any child a good school within reasonable walking distance. Engelhardt (1) in the Sewanhaka, New York, high-school district survey based his recommendations for ultimate high-school needs upon (a) analyses of elementary- and high-school enrolment trends, (b) trends in home building and an estimate of the number of homes in the area after the saturation point in building is reached, and (c) the establishment of a ratio of pupils to homes, which ratio predicts the total possible pupil population in the area after it is completely built up. Wilson (8) in the Reading, Massachusetts, school plant survey arrived at his recommendations for a long-range school plant planning program thru the analysis of enrolment and population trends, the establishment of a ratio

between population and *elementary* enrolment, and the determination of ratio for prediction of elementary enrolment (Grades I-VI) to secondary enrolment (Grades VII-XII).

The problem of determining school plant needs on the state and federal level is quite different from that of the local level. On these broader levels the primary purpose of school plant studies almost invariably is to set up an estimate on the total amount of money necessary to bring the total school plant needs of state or nation up to a recommended standard of excellence or efficiency.

No recent research studies on determining school plant needs on the state level have been reported, but several attempts have been made to determine total school plant needs on a nationwide basis. Some studies have developed estimates on the basis of classrooms needed, some on the basis of children for whom facilities are needed, and some on the basis of the money needed to provide adequate school housing facilities. The Research Division of the National Education Association reported (5) that in 1941, 1214 school districts had urgent need for additional school housing facilities for 120,439 children, while in 1942 these same districts urgently required school housing facilities for 123,067 children, an increase of 2.2 percent. The U. S. Office of Education (7) reported from questionnaires returned from 736 counties and 650 cities in thirty-six states, that a total of 5206 new buildings and additions were needed in those districts of which 2597, or approximately 50 percent, were elementary buildings, and the remainder were distributed among various types of schools.

On a qualitative rather than a quantitative approach to the question of nationwide postwar school housing needs, the Research Division of the NEA (4) set up recommendations for the specific types of facilities needed for elementary- and high-school buildings, the size of school grounds, the optimum capacity of buildings of various types, and the instructional equipment that should be provided. On the basis of money needed for nationwide school plant improvement, Fowlkes (2) estimated that five billion dollars would be needed to construct new buildings and repair old ones, while the National Resources Planning Board (6) concluded that nine billion dollars would be needed over a period of five years (1.86 billions annually) to "eliminate deficiencies in school building facilities for pre-school, elementary school, and high school pupils."

Bibliography

1. ENGELHARDT, NICKOLAUS L. *The School Building Needs of the Sewanhaka High School District.* New York: Teachers College, Columbia University, 1941. 56 p.
2. FOWLKES, JOHN G. *Planning Schools for Tomorrow.* U. S. Office of Education, Leaflet No. 64. Washington, D. C.: Superintendent of Documents, Government Printing Office, 1942. p. 20.
3. HOLY, THOMAS C. "Utilization of School Plant." *Minneapolis School Survey.* Minneapolis: Minneapolis Public Administration Service, 1942.
4. NATIONAL EDUCATION ASSOCIATION, RESEARCH DIVISION. *Proposals for Public Education in Postwar America.* Research Bulletin, Vol. XXII, No. 2. Washington, D. C.: the Association, April 1944. p. 57-58.

5. NATIONAL EDUCATION ASSOCIATION, RESEARCH DIVISION. *The Nation's Schools After a Year of War.* Research Bulletin, Vol. XXI, No. 2. Washington, D. C.: the Association, April 1943. p. 35.
6. NATIONAL RESOURCES PLANNING BOARD. "National Resources Development Report for 1943." *Postwar Plans and Programs.* Part 1. Washington, D. C.: Superintendent of Documents, Government Printing Office, 1943. p. 73.
7. U. S. OFFICE OF EDUCATION. *School Building Needs.* Leaflet No. 68. Washington, D. C.: Superintendent of Documents, Government Printing Office, 1943.
8. WILSON, WILLIAM K. *School Plant Survey and Long-range Planning Program, Town of Reading, Massachusetts.* Reading, Mass.: the Annual Report of the School Committee, 1944.

CHAPTER III

The School Plant As an Educational Instrument

CHARLES W. BURSCH

THE CONCEPT OF FUNCTIONAL PLANNING of school buildings has grown and expanded with use. Not many years ago the term applied largely to the effort to have proportionately more of the total area and cost of a school building devoted to educational and service areas, and consequently a less proportion to architectural features designed to produce monumental structures. Furthermore, under that concept school sites are located, arranged, and sized for educational service rather than for the satisfaction of community pride. School plants developed in the past two decades reflect commendably that definition of functional planning.

There is growing evidence, however, that this concept of functional planning of the school plant is being expanded to include consideration of it more specifically as an educational instrument. The best evidence of such emphasis is that teachers, supervisors, principals, and school architects challenge the adequacy of "standard" or traditional facilities for meeting the demands made upon them by modern curriculums content, methodology, and educational and social objectives. This may mean that school planners and teachers no longer will be satisfied with the evaluation of a school plant largely as an adequate and economical space and shelter for pupils and teachers while educational growth and development occurs. They will, in addition, expect that every possible opportunity will be realized to have the physical plant contribute positively to the approved educational process and to the desired enrichment of the educational offering in schools.

This chapter will review the recent emphasis in educational research and literature on the desirability of securing, in school plants, optimum conditions for growth and development of pupils.

Elementary Schools

Sands (6) described the situation thus: "During the last fifty years, the concepts of the elementary curriculum and the teaching process have changed to such an extent that a school environment consisting of the formalized, poorly-equipped, four-walled school room is no longer sufficient. . . . Modern teaching method requires that the teacher be equipped with sufficient physical materials and spacial facilities to encourage wholesome uncrowded living in the school environment. . . . The environment itself should facilitate the development of the child. . . . Every major aspect of the modern elementary curriculum calls for special provisions in the school plant."

Sears (6:15, 22) writes "The present trend is for the school plant to become a highly specialized part of the instructional equipment of the

school." and "If we can add the architect's knowledge, his art, his imagination to the knowledge, art, and imagination of teachers who can build a school in these new terms then we shall get a school home that is not only a shelter but also a vital instrument of instruction and of social progress in its community."

Long (14) after studying twenty school plants housing progressive schools and analyzing the judgments of 289 elementary teachers, principals, and supervisors regarding the desirability of certain physical facilities for an activity program, concluded: "Elementary school plant facilities have always lagged behind the demands of the curriculum. . . . Progress is being made but few school plants have been conceived as yet which adequately meet the needs of the more progressive type of elementary school program. This program is dynamic, while the physical facilities tend to become standardized and thus remain static." Long also listed the inadequacies of the twenty plants studied and described desirable facilities for an activity program.

Englehardt and associates (10) presented a cross section of planning of elementary classrooms as they have been designed thruout the nation. It is their view that: "If education in a democracy is to advance, reasonable freedom must be allowed the local communities . . . in devising the school building spaces which will most definitely further the aims upon which the locality and its professional educational workers have agreed. . . . Not only will safety, sanitation, good lighting, and student and teacher comfort be used as criteria, but human relationships and the learning processes themselves will play greater roles in future planning." Their check list of basic considerations for use in planning an elementary-school classroom represents a wholesome and forward-looking additional procedure to that of using the traditional check lists of standard practices and items. Planning procedures are given an important role in securing more useful buildings.

Hooper (12) emphasized children's need of space in which to grow as contrasted to having every last detail planned into the school by educators and architects and having the building too splendid to be marred by their normal activities. Bursch (5) found well-understood cooperative planning procedures undertaken by competent persons more important than standards in producing elementary classrooms that would implement educational procedures. Misner (15) described current trends in three areas of education: (a) organization and administration, (b) curriculum practices, and (c) school and community relationships, and discussed the school facilities needed to accomplish them. Hamon (11) discussed the elementary-school plant of tomorrow in terms of wider school and community use and more adequate space for pupil activity. Engelhardt (9) selected and illustrated some of America's best elementary schoolrooms.

Secondary Schools

Wade (19) assumed that each element of a school plant exercises some influence upon every pupil and prepared an extensive scale to measure

the secondary school as a part of the pupil's environment. Altho built thoroly and painstakingly, this scale may have but small value in the school plant field inasmuch as the warning is given not to use it in selecting items to be added to schools. However, as a beginning in definite research for examining the correlation between certain plant provisions and the total educational merit of a school, this study has real significance.

The General Education Board made a grant for a three-year project exploring in five cities the services that art museums can render to secondary schools. Munro (16) in a chapter on conclusions and recommendations stated: "One of the most insistent notes in the reports from all five cities was the call for better facilities, in school buildings, for the exhibition and study of visual materials. . . . The precise nature of these facilities cannot be recommended without much more experimental investigation. . . . But at least we can be sure that school architects will be asked to confer more carefully with art teachers and others responsible for the exhibit program, before crystallizing their plans for new buildings."

Pierce and Hunter (17) portrayed a situation where facilities were provided and arranged to meet carefully determined educational objectives and instructional procedures. Dolloff and others (8) described in detail the construction and use of facilities for a completely individualized but correlated instruction in the sciences and arts. Flexibility, accessiblity, and visibility for supervision are the characterstics most stressed. How a proposed liberalized and enriched program of secondary education can be freed from the limitations placed upon it by traditional high-school plants was considered by Bursch (4).

Studies of General Interest

Brownell (3) felt that progressive businessmen in some communities would be shocked to see that while they have scrapped outmoded lighting, machinery, and furniture and have air conditioned and made sanitary their offices, working areas, toilets, and restrooms, they are sending children to school in poorly lighted, poorly ventilated quarters and asking them to work with equipment that handicaps rather than facilitates the business of education.

Reid (18) gave numerous examples of how an architect, properly aware of educational objectives, may make parts of the school structure the means of furthering those objectives.

Broom, Thompson, and Condon (2), with the aid of extensive tabular and graphic presentations of the results of numerous semitechnical studies, revealed "how these facts can be translated into procedures and practices that will improve classroom environment . . . in order that children may enjoy the greatest opportunities possible in our public schools."

Schools should be "living organisms, not frozen into a shape by outmoded accommodations," is the theme of an able and pointed discussion and analysis by Baker (1). He recommended buildings designed for not

more than a twenty-year life, cheaply erected, easily remodeled, or removed, and having high salvage value instead of traditional school buildings described as "monuments to outmoded educational theory."

The inability of teachers to accomplish desired results, because of careless building planning is deplored by Dent (7). In classrooms with no service electric outlets, teachers are denied the use of modern visual aids. The installation of such outlets after the building is constructed is expensive. Dent said that equipment manufacturers have made available planning services that can be used to advantage.

Lescaze (13) declared that educational programs have progressed far in advance of the planning and design of school buildings. He wondered why schoolboards sponsor progressive educational programs yet at the same time "retrogress to obsolete architectural formulae" when new school buildings are considered. Flexibility is reported as the key problem if our school buildings are to meet "more adequately the new demands of new methods of education."

Educators, school plant surveyors, architects, and many other interested and competent persons today believe that it is possible for the school plant to make a more substantial contribution to the realization of educational objectives. Such a contribution can be expedited by: (a) experience and research in methods of using and evaluating the planning potentialities of educational staffs; (b) research that would reveal the degree to which the nature of the plant, and plant inadequacies, are contributing factors to the time lag between the adoption or authorization of new curriculums, methods, or services and their general and effective operation; (c) exploratory research into the correlation of plant provisions with educational results; (d) research studies of the effectiveness in use of plants designed for flexibility and of the possibilities of further exploitation of planning for inexpensive alteration.

Continuous cooperation and interaction among teachers, curriculum makers, teacher trainers, and school plant planners is essential if education is to be given even the possibility of being tooled, and, when necessary, retooled as adequately as are industrial plants for their purposes. This can be made a reality only when the public as well as the teaching profession comes to know specifically what is involved and to believe that it is worth what it costs.

Bibliography

1. BAKER, GEOFFREY. "To Set Our Children Free." *Magazine of Art* 35: 284-89; December 1942.
2. BROOM, M. EUSTACE; THOMPSON, CHARLES E.; and CONDON, LOZIER. *Improving the Classroom Environment; a manual for teachers seeking to promote effectively the hygienic development of children.* El Paso, Texas: El Paso Public Schools Pamphlet, 1943. 102 p.
3. BROWNELL, SAMUEL M. "How to Gain Community Support for Postwar Building." *Nation's Schools* 34: 23; September 1944.
4. BURSCH, CHARLES W. "Adapting School Plants to New Programs." *California Journal of Secondary Education* 17: 158-60; March 1942.

5. BURSCH, CHARLES W. "The Planning of Classrooms for Postwar School Buildings." *American School Board Journal* 108: 15-18, 67; January 1944.
6. CALIFORNIA ELEMENTARY SCHOOL PRINCIPALS ASSOCIATION. *Elementary School Environment and the Modern Curriculum.* Thirteenth Yearbook. Parker School, Oakland, Calif.: the Association, 1941. 160 p.
7. DENT, ELLSWORTH C. "Plan Buildings for Visual Aids." *American School Board Journal* 107: 42-43; September 1943.
8. DOLLOFF, NORMAN H., and OTHERS. "Facilities for Correlated Work in the Sciences and Arts." *American School and University.* New York: American School Publishing Corp., 1943. p. 193-95.
9. ENGELHARDT, NICKOLAUS L. "America's Best Elementary Classrooms." *School Executive* 63: 53-55; June 1944.
10. ENGELHARDT, NICKOLAUS L., and SCHOOL PLANNING ASSOCIATES. *Elementary School Classrooms, Portfolio A.* New York: Teachers College, Columbia University, 1941. 80 p.
11. HAMON, RAY L. "Planning the Elementary School Plant of Tomorrow." *School Executive* 63: 50-52; June 1944.
12. HOOPER, LAURA. "Give Me a Barn." *Childhood Education* 18: 396-97; May 1942.
13. LESCAZE, WILLIAM. "Types of Schools to Serve Tomorrow's Needs." *American School and University.* New York: American School Publishing Corp., 1943. p. 33-36.
14. LONG, FRANK M. *Desirable Physical Facilities for an Activity Program.* Contributions to Education, No. 593. New York: Teachers College, Columbia University, 1933. p. 100.
15. MISNER, PAUL J. "Activity Programs Make New Demands on Elementary Schools." *The Nation's Schools* 33: 42-44; March 1944.
16. MUNRO, THOMAS. "Conclusions and Recommendations." *The Art Museum Comes to the School.* New York: Harper and Brothers, 1944. p. 140-41.
17. PIERCE, PAUL R., and HUNTER, R. TED. "Reorganizing a High-School Shop." *Industrial Arts and Vocational Education* 26: 78-80; March 1937.
18. REID, T. C. "Why Can't the Schoolhouse Teach?" *School Executive* 62: 20; April 1943.
19. WADE, J. THOMAS. *A Measurement of the Secondary School As a Part of the Pupil's Environment.* Contributions to Education, No. 647. New York: Teachers College, Columbia University, 1935. 68 p.

CHAPTER IV

Staff Participation in Plant Planning

HAROLD E. CHASTAIN

EVIDENCE FROM THE FIELD indicates that the full utilization of school faculties and noncertificated personnel in planning educational plants is yet largely sporadic and incidental. Altho the philosophy of teacher participation has practically reached the undebatable stage (38), practice lags woefully. Research which explores actual values and specific types of contributions which school staffs might make are negligible, and studies involving technics and procedures of utilizing the intelligence and experience of teachers are needed. An increasing number of excellent examples, however, are in evidence.

Plant Planning and Democratic School Administration

The desirability of participation in plant planning is inherent in the concept of democratic school administration, and, hence, of democracy itself. Collective attack on educational problems, as stressed by Leonard and others (19), is necessary.

The role of the teacher, according to Rhodes (33), is solely involved in policy-execution rather than policy-making. Palm (29) pointed out that the newer conception of staff sharing in the making of decisions "... should not be thought of as a favor granted by the administration, but rather as a right and obligation." Reavis (31) stated that democratic participation "... means disagreement, discussion, more disagreement, further discussion, resulting in a final course of action, which, in many cases is a compromise. . . ." Opportunity for all interested persons to join in the formation of plans and purposes for the common good was emphasized by the California Elementary Principals Association (5), Williams (38), and Tyler as quoted by Reavis (31). Rhodes (33) saw in the movement to give teachers a share in policy-making, a return to the democratic principles in effect about a century ago when schools were administered directly by lay boards. Barham (3) considered it as a current manifestation of the reconstruction and extension of the concept of democracy while Reavis (31) emphasized the necessity to differentiate between different grades and degrees of professional and technical competency in its use.

General Treatments of Democratic Administration

General treatments of democracy in school administration, with its many ramifications, were evidenced by the works of Miller (25), Koopman, Miel, and Misner (18), Moehlman (26), Reavis and Judd (32), and Rhodes (33). Williams (39, 40) described a questionnaire study which brought out the discrepancies between viewpoints of teachers, principals, and superintendents, in six selected school systems, as to the actual effectiveness of

teacher-participation in twenty-eight phases of administration. On the item, "Planning School Buildings," only 13 percent of teachers believed that their participation was bona fide, while 56 percent of the principals and 56 percent of the superintendents believed it to be more than mere consultation.

Effects of Participation on Schools

Among the advantages to education in general and to school systems in particular accruing from staff participation in administrative policies are the marshaling of intellectual resources and the wisdom and judgment of those whose business it is to make the school an efficient organization. To these Barham (3) added goodwill, cooperation, and enthusiasm. Loomis (21) asserted that teacher-participation strengthens the democratic program without impairing the rights of the people.

Effects on Teachers

If all school procedures and processes are established in order to make good teaching possible, the effects of democratic policy on teachers assume a position of importance. California Elementary Principals Association (5) pointed out that one achievement by an individual increases both the desire and the ability to engage in other undertakings. Other teacher gains to be realized by participation mentioned by Williams (40) were increased growth, morale and *esprit de corps*, better understanding of local policies, greater breadth of vision, initiation, increased responsibility, and the tendency to practice like relationships with pupils. "There is no substitute," said Greene (12), "to take the place of responsibility."

Thus, the principle of participation passed from the stage of mere gesture and "sops to Cerberus" to the point where, as Pierce (30) stated, "it increases the effectiveness of school work." Gilchrist and Woelfel (11) believed that student as well as teacher cooperation in the selection of equipment increases the respect for property and an appreciation of what money can buy.

Avoiding Past Mistakes

The inclusion of the teaching staff in plant planning is essential, affirmed McGrath (22), to help avoid the costly mistakes of the past. Yager (41) listed ten oversights in the construction of a teachers college laboratory school which might not have occurred if planning had included the advice of sound-thinking teachers who were familiar with day-to-day instruction. When the significance of teacher contributions are realized, especially in the above areas, said Bursch (4) ". . . it will become obvious that no school building can be as well planned without the assistance of the teaching and supervisory staff as with such assistance." Miller (24), in an outline of procedure in building, advocated very emphatically the enlistment of every teacher.

Teacher Participation Essential to Functional Planning

The close connection of form with function, as mentioned by Moehlman (26), adds weight to the recognition and use of the technical competence of teachers as well as architects, engineers, and business managers advocated so strongly by the Educational Policies Commission (28). To this end Smith (36) said: "The best school building is the one which is planned functionally; which translates the educational aims, methods, and ideals into an actual workable program."

To this point, Rosenstengel (35), Stowell (37), Miller (24), Holmes and Shigley (15), Engelhardt and associates (10), and Engelhardt and Engelhardt (9) have commented at some length while the latter also emphasized community usage as a basis for planning.

Effective Areas for Staff Participation

Among specific items on which teachers may assist, McIntosh (23) mentioned size and arrangement of the rooms, lighting, and furnishings. Logan and Cleveland (20) added workbenches, sinks, height of blackboards and bulletin boards, special display facilities, window seats, alcoves, fishponds, space for special activities, provision for small group conferences and activities, storage space, and creative activity facilities. An example of the type of assistance in fore-planning contributed by teachers was described by Holmes (14) in his description of the new J. W. Sexton High School of Lansing, Michigan.

Collaboration as a Policy

From the standpoint of utilizing the staff adequately in plant planning an emphasis has been placed on architects, schoolboards, administrators, and special consultants to be collaborators in the fullest sense. Bursch (4) and Creighton (8) stressed board cooperation; Stowell (37) and Holmes and Shigley (15), the architect; and, Hanson (13), and Koopman, Miel, and Misner (18), the collaboration of the consultant.

Effect on Public Relations

That the fullest participation of staff and laymen pays dividends in public relations was shown by the accounts of Houston (17) and Hanson (13). Success in obtaining public fiscal support was attributed to the widespread knowledge and goodwill engendered by democratic sharing in the plans.

Staff Collaboration as a Continuous Policy

From the literature a number of cases were evident in which staff participation in administrative policy-making, including school plant planning, was a consistent continuous policy. In San Diego, California (6), an executive council representing all branches of the professional staff met periodically to determine policies which included problems of school building and

equipment. Likewise, at Saginaw, Michigan (24), an elected coordinating council chose an executive committee to formulate plans and policies and to assist in plant planning. Under the direction of experts from the Harvard School of Education, teachers, city officials, school administrators, and selected laymen of Brewer, Maine (17), met for an extended period to study building requirements in relation to the educational program, the community needs, and financial resources. One result was a successful bond election for school building purposes. In Burbank, California (28), elementary and secondary teachers worked for months in planning buildings and equipment. To perfect plans for a new rural elementary school, teachers, custodians, trustees, the administrator, and the architect, at Avenal, California (2), sat around the conference table monthly for an entire year.

Examples of Cooperative Planning

Among other recent building programs where teachers, custodians, principals, parents, supervisors, and pupils were given a definite share in the planning, were those at Waterloo, Iowa (20); Green River, Wyoming (23); Elmont, Long Island, New York (13); Lansing, Michigan (14); Lincoln, Nebraska (1); and Tucson, Arizona (27). In Amarillo, Texas (34), the superintendent, business manager, both girls' and boys' physical education teachers, and the architect studied and planned together to produce the layout for a combined girls' and boys' gymnasium plant which now satisfactorily serves 1000 pupils of both sexes.

Plans for a swimming pool to serve a high school and junior college at Auburn, California (6), were initiated by a planning committee composed of members of the physical education and health departments of both schools, the maintenance personnel, and the administrative staff. Williams (40) reported, that, in the planning of the Crow Island School of Winnetka, Illinois, the architect spent several weeks in the schools of that community, attending faculty meetings and watching pupils and teachers at work in order to catch the spirit and philosophy as expressed in actual practice. The result was a building to fit the educational program.

A portfolio of elementary-school classroom designs, collected by Engelhardt and associates (10) in a large measure reflected the cooperative participation of teachers in the original planning. Koopman, Miel, and Misner (18) reported a study in which an architect's plans and model were submitted to a teaching staff for critical analysis. The teacher reaction was studied by an educational building consultant who classified their suggestions. Twelve were judged practical, six debatable, and only two were declared impractical.

The Future of Staff Participation

Holmes and Shigley (15) summarized the question of staff participation when they declared: "Whether your goal is a whole new school plant, a new music or shop building, or merely the better use of existing facilities,

begin now to solicit suggestions from your teachers." As to the future Engelhardt and associates (10) predicted that ". . . human relationships and the learning processes themselves will play greater roles in future planning." Finally, as Rhodes (33) so aptly stated, "Until the schools reflect democratic thinking in every aspect of their structure and operation, they are not fully prepared to nurture and protect the democratic concept in the mind of youth."

Bibliography

1. AMERICAN SCHOOL BOARD JOURNAL. "Planned for Functional Uses; the Northwest High School, Lincoln, Nebraska." *American School Board Journal* 106: 29-33; June 1943.
2. AVENAL ELEMENTARY SCHOOL DISTRICT. *Activity Type Classroom in the Avenal Elementary School.* Avenal, Calif.: the District, 1942. (Mimeo.)
3. BARHAM, THOMAS C., JR. "Democracy In School Administration." *American School Board Journal* 104: 15-17; June 1942.
4. BURSCH, CHARLES. "Planning of Classrooms for Postwar School Buildings." *American School Board Journal* 108: 15-18; January 1944.
5. CALIFORNIA ELEMENTARY SCHOOL PRINCIPALS ASSOCIATION. *Guiding Children in Democratic Living.* Fourteenth Yearbook. Parker School, Oakland, Calif.: the Association, 1942. 168 p.
6. CHASTAIN, HAROLD E. *Plan of Procedure for the Construction of a Swimming Pool.* Auburn, Calif.: Placer Union High-School District, 1943. 10 p. (Mimeo.)
7. CRAWFORD, WILL C. "Democratic Policy-Making in a School System." *School Executive* 63: 32-34; March 1944.
8. CREIGHTON, THOMAS H. "Basic Planning Is Needed Now." *Nations Schools* 33: 34-37; February 1944.
9. ENGELHARDT, NICKOLAUS L., and ENGELHARDT, NICKOLAUS L., JR. *Planning the Community School.* New York: American Book Co., 1940. 188 p.
10. ENGELHARDT, NICKOLAUS L., and SCHOOL PLANNING ASSOCIATES. *Elementary School Classrooms, Portfolio A.* New York: Teachers College, Columbia University, 1941. 80 p.
11. GILCHRIST, ROBERT, and WOELFEL, NORMAN. "Equipment, Supplies, and Materials for the Secondary Schools." *School Executive* 63: 40-42; July 1944.
12. GREENE, CHARLES E. "Teachers Need Responsibility; When They Get It They Grow." *Nations Schools* 28: 49-50; August 1941.
13. HANSON, ABEL A. "Elmont Plans for School Buildings." *American School Board Journal* 106: 21-23; January 1943; 35-38; March 1943.
14. HOLMES, WARREN S. "The New J. W. Sexton High School, Lansing, Michigan." *American School Board Journal* 108: 36-41; January 1944.
15. HOLMES, WARREN S., and SHIGLEY, ARTHUR R. "A School Building Planned Around the Educational Program." *The American School and University,* 1943. New York: American School Publishing Corp., 1944. p. 43-46.
16. HOLMES, WARREN S., and SHIGLEY, ARTHUR R. "School Buildings After the War." *American School Board Journal* 106: 17-19; January 1943.
17. HOUSTON, HOWARD R. "Democracy Works in Brewer, Maine." *American School Board Journal* 105: 42; September 1942.
18. KOOPMAN, G. ROBERT; MIEL, ALICE; and MISNER, PAUL J. *Democracy in School Administration.* New York: D. Appleton-Century Co., 1943. 330 p.
19. LEONARD, J. PAUL, and OTHERS. *An Evaluation of Modern Education.* New York: D. Appleton-Century Co., 1942. 299 p.
20. LOGAN, JACK M., and CLEVELAND, MORTIMER B. "Longfellow School: Complementary Accounts." *American School Board Journal* 106: 33-36; April 1943.
21. LOOMIS, ARTHUR K. "Is Democracy in School Administration Democratic?" *School Executive* 64: 45-46; September 1944.
22. MCGRATH, DON E. "Experience Must be Reflected in Our Plans." *School Business Affairs* 10: 3, 6; July 1944.
23. MCINTOSH, R. H. "Lincoln High School, Green River, Wyoming." *American School Board Journal* 108: 37; May 1944.

24. MILLER, CHESTER F. "Twelve Steps in Planning a School." *Nations Schools* 33: 40-41; March 1944.
25. MILLER, WARE I. *Democracy in Educational Administration.* New York: Teachers College, Columbia University, 1942. 117 p.
26. MOEHLMAN, ARTHUR B. *School Administration, Its Development. Principles and Future in the United States.* Boston: Houghton Mifflin Co., 1940. 929 p.
27. MORROW, ROBERT D. "Tucson Builds for the Future." *American School Board Journal* 106: 36-40; January 1943.
28. NATIONAL EDUCATION ASSOCIATION AND AMERICAN ASSOCIATION OF SCHOOL ADMINISTRATORS, EDUCATIONAL POLICIES COMMISSION. *Learning the Ways of Democracy.* Washington, D. C.: the Commission, 1940. 486 p.
29. PALM, REUBEN R. "A Teachers Argument for Democracy in Administration." *American School Board Journal* 100: 21-22; February 1940.
30. PIERCE, PAUL R. *Developing a High School Curriculum.* New York: American Book Co., 1942. 367 p.
31. REAVIS, WILLIAM C. *Democratic Practices in School Administration.* Chicago: University of Chicago Press, 1939. 214 p.
32. REAVIS, WILLIAM C., and JUDD, CHARLES H. *Teacher and Educational Administration.* Boston: Houghton Mifflin Co., 1942.
33. RHODES, ALVIN E. "Fundamentals of Democratic Administration." *American School Board Journal* 109: 27-28; September 1944.
34. ROGERS, CHARLES M. "A Practical Physical Education Building." *American School Board Journal* 104: 33-37; June 1942.
35. ROSENSTENGEL, WILLIAM E. "Budgeting for Schoolhouse Construction." *American School Board Journal* 108: 20; May 1944.
36. SMITH, HENRY L. "A Summary of the Demands for Increased School-Building Facilities to Meet the Needs of the Postwar Period." *American School Board Journal* 108: 19; January 1944.
37. STOWELL, KENNETH K. "Making the Most of Your Architect." *Nations Schools* 33: 35; March 1944.
38. WILLIAMS, LESTER A. *Secondary Schools for American Youth.* New York: American Book Co., 1944. 531 p.
39. WILLIAMS, OMER S. "Administrative Activities in Which Teachers Participate Democratically." *American School Board Journal* 105: 40-41; September 1942.
40. WILLIAMS, OMER S. "Teachers and Democratic Administration." *Clearing House* 18: 515-18; May 1944.
41. YAGER, SYLVAN A. "If We Were Building Again." *American School Board Journal* 105: 30; November 1942.

CHAPTER V

Wartime School Plant Facilities

ANDREW H. GIBBS

SCHOOL FACILITY NEEDS precipitated by the shifting and concentration of population as a result of the war program were reported to Congress in a study by the U. S. Office of Education (33). This preliminary study revealed that hundreds of local communities were unable to provide adequate school facilities and services and served to point out the obligation of the federal government to lend financial assistance where these concentrations of need occurred.

Because of the serious shortage of critical materials and manpower, the federal government was faced both with facilitating and restraining school construction; facilitating and providing it in war areas where influxes of population overtaxed existing facilities and restraining it in nonwar areas. Effective facilitation was achieved thru passage and implementation of the community facilities amendments to the Lanham Act (1, 19) and curtailment of nonessential building (11, 18) resulted from the priorities system established under the War Production Board.

The Lanham Act and Its Administration

Practically no school building construction was carried on during the defense and war period except under the Lanham Act and its amendments and to replace burned buildings. These Acts—Public Laws 849 (October 14, 1940), 137 (June 27, 1941), 409 (January 21, 1942), and 150 (July 15, 1943)—authorized the appropriation of federal funds in the amount of $500,000,000 for community facilities including school construction and maintenance and operation of school facilities (2, 19).

Since the Lanham Act was administered by the administrator of the Federal Works Agency, information on progress and accomplishments in providing school facilities in the war areas was found in the annual reports of that agency (15, 17, 18), and in its processed monthly statistical tables (16) issued for use of its Washington and regional offices primarily, but sent to individuals upon request. The annual reports of the U. S. Commissioner of Education (31, 32) showed the activities of the office in cooperating with the state departments of education, the Federal Works Agency, and the War Production Board in determining educational needs.

Approximately 900 certificates of necessity were issued by the U. S. Commissioner of Education (32) to the administrator of the Federal Works Agency during the biennium 1941-43. After August 12, 1943, these determinations of educational need were made by the Federal Works Agency under a joint agreement entered into by the Federal Works Agency, the Federal Security Agency, and the Bureau of the Budget. This joint agreement says in part:

The Federal Works Agency is equipped to determine the need and extent of need in cooperation with local governments. The Federal Security Agency has not heretofore been called upon for recommendations regarding PWA, WPA, or other school construction projects, and has no responsibility for standardizing such facilities. It is agreed that no recommendations by the Federal Security Agency will be required for these facilities.

Michaelis (25), in a doctoral dissertation, analyzed the administration of the Lanham Act school program with reference to the problem of federal control over public education. He found that "some minor, temporary controls over certain local school jurisdictions indirectly resulted" but that "no new significant controls over public education developed . . . as of August 1, 1942." Some of the periodical literature on the subject shows various emphases on and interpretations of the program and its administration. Joyal (24), for example, expressed concern about federal control; Morphet (26) and others (8) were dissatisfied with the procedure of having determinations of educational need made by a noneducational agency; and an editorial in *Nation's Schools* (27) made accusations of muddling.

The federal government's participation thru the PWA and WPA programs in the construction of schools and educational buildings was extensive and carried over into the fiscal year 1941 (17). This broad experience in school construction was acknowledged in the joint agreement, part of which was quoted above, under which the FWA made determinations of educational need in war areas. In addition, PWA and WPA facilities and personnel were utilized in the defense and war public works programs of the FWA. Because of this tie-in of these constituent agencies of FWA in the peace and war program of school building construction, Branom's study (7) is interesting in showing the influence of PWA on construction costs and its major permanent effects. He did not, however, assay the effect of the location of PWA school buildings on the state program to improve attendance-area and administrative-unit organization—which study should be made for the Lanham Act as well as for other school building construction financed wholly or in part with federal funds.

Replacing Burned Buildings

The U. S. Office of Education issued approximately 400 statements of need to the War Production Board for school plant facilities, principally needed because of fire or condemnation proceedings (32). These were not Lanham Act projects and were constructed wholly with local and state funds.

"Temporary" School Buildings

The Federal Works Agency issued, under date of February 16, 1942, a set of plans (twelve sheets) for various size "temporary" school buildings limited to one- and two-story masonry and one-story wooden structures. Under date of July 15, 1942, a second set of plans (sixteen sheets) was issued by FWA for various "typical units" of emergency school buildings.

These plans were used by employees of the FWA and the U. S. Office of Education when visiting localities to determine need; they were not available for distribution.

Buildings constructed by the FWA were described in 1942 as follows:

> The typical school building was a one-story structure with a simple space-heating system, minimum plumbing, minimum lighting, and a combined lunch-assembly-recreation room. No gymnasium or auditorium was permitted; no radio, electric clock, or signal system; no architectural embellishments. (18)

As a result of a preliminary study of the adaptability of demountable prefabricated building construction to school building, Barrows (5) concluded that they were practicable. She felt they were highly desirable in the war areas with urgency for immediate use; they were relatively inexpensive; and their use was not limited to the emergency period. This is a thought-provoking circular. It might well be considered in local school unit reorganization programs. Hacker (20), Power (29), and Reid (30) also urged the use of temporary construction.

Wartime Restrictions

The so-called "200 percent-utilization" agreement between the War Production Board and the Federal Works Agency, which became effective in June 1942, increased the problems of schools in the war areas. This agreement provided that no new school should be constructed or an old one enlarged until the existing school facilities in the area were being used two shifts daily—200 percent of normal capacity (18). This resulted in double sessioning in some or all schools in the war areas before new construction was approved; special conditions did not permit rigid application of the rule.

Federal restrictions on the use of critical materials appeared in the *Federal Register* (14) and many of these orders affecting schools and some interpretation appeared in the *American School Board Journal* (3, 13), *Nation's Schools* (21, 23), the *School Executive*, *School Management*, *School Business Affairs*, and *Education for Victory* (10, 12). Holy (22) showed for five cities actual and proposed expenditures for supplies. He indicated that there had been a marked drop in expenditures for new and replacement equipment during the same period which reduction probably resulted from inability to purchase.

War Production Training Equipment Needs

Equipment needs arising out of the program for training workers for war production of the U. S. Office of Education were serious. Congress appropriated thirty million dollars for the acquisition of equipment in connection with the supplementary and preemployment refresher courses (31, 32) and procedures were effected with the Office of Production Management for securing preference ratings for training equipment. Some of the schools themselves made small tools and precision measuring instruments.

Bibliographical Note

The total literature on wartime school building is meager. Official documents such as the *Federal Register* (14) show as of the date of issue the regulations and notices of the Office of Price Administration, the War Production Board, and other federal agencies. The individual applications of local school administrative units to the Federal Works Agency and the War Production Board for facilities and priorities for schools (and the field studies on file in the U. S. Office of Education) are not yet available for public use. The internal administrative orders of the Federal Works Agency are duplicated for use of its employees and cooperating agencies in Washington and the regional offices and are not generally available to individuals not in its employ.

Since the official documents on file in the several federal agencies concerned with the program are not available for study, the research in this field must come later. Particularly helpful to the educational research worker, when these documents become public property thru deposit in the National Archives, will be those data on the project applications enrolments, teachers, cost of construction, tax rates, and revenue. It is to be hoped that after they become available, these reliable data will contribute studies that show the effects of federal subsidy, construction practices, and costs of school buildings.

Bibliography

1. ALVES, HENRY F. "Defense Program and School Plants." *Review of Educational Research* 12: 162-67; April 1942.
2. ALVES, HENRY F. "School Facilities in Defense Areas." *School Life* 27: 115-16, 120; January 1942.
3. AMERICAN SCHOOL BOARD JOURNAL. "Vallejo Builds Schoolhouses for Wartime and Peace." *American School Board Journal* 105: 35-38; October 1942.
4. BARBOUR, RICHMOND. "Elementary School Housing: An Appraisal of a Wartime Expedient." *Elementary School Journal* 42: 597-602; April 1942.
5. BARROWS, ALICE. *Modern Demountable Construction for School Buildings.* Education Circular No. 201. Washington, D. C.: U. S. Office of Education, n.d. (c. 1941.) 11 p. (Multolithed.)
6. BORGERSON, NORMAN E. "School Construction in Wartime." *Michigan Education Journal* 20: 156-59; November 1942.
7. BRANOM, WAYNE T. *A Study of the Effect of the Public Works Administration on the Public Schools in Illinois, 1933-1940.* New York: New York University, 1941. 179 p. (Doctor's thesis.)
8. CONGRESSIONAL DIGEST. "State School Administrators Recommend That Lanham Act Educational Funds Be Administered through the U. S. Office of Education." *Congressional Digest* 23: 81-82; March 1944.
9. EDGAR, JAMES W. "Schools in War Production Areas." *Texas Outlook* 26: 13-15; May 1942.
10. EDUCATION FOR VICTORY. "Facilities Available for Extended School Programs." *Education for Victory* 1: 27; April 15, 1943.
11. EDUCATION FOR VICTORY. "Wartime Restrictions As They Affect Schools: Reports from Joint Conference of War Agencies and School Officials." *Education for Victory* 2: 1, 14-17; December 15, 1943.
12. EDUCATION FOR VICTORY. "WPB Issues Priority Regulations Affecting School Purchases." *Education for Victory* 1: 13-14; April 15, 1942.

13. ETHINGTON, CHARLES, and COLLETT, C. A. "A Washington View of School Purchasing and Maintenance for 1943." *American School Board Journal* 107: 33-34; July 1943.
14. FEDERAL REGISTER. Washington, D. C.: Superintendent of Documents, Government Printing Office. (Carries executive orders of the President and regulations and notices of various federal government departments and offices.)
15. FEDERAL WORKS AGENCY. *Fourth Annual Report of the Federal Works Agency for the Fiscal Year Ended June 30, 1943.* Washington, D. C.: Superintendent of Documents, Government Printing Office, 1943. 72 p.
16. FEDERAL WORKS AGENCY. (Monthly statistical tables on construction and services under Lanham Act.) Washington, D. C.: the Agency. (Processed.)
17. FEDERAL WORKS AGENCY. *Second Annual Report of the Federal Works Agency for the Fiscal Year Ended June 30, 1941.* Washington, D. C.: Superintendent of Documents, Government Printing Office, n.d. 473 p.
18. FEDERAL WORKS AGENCY. *Third Annual Report of the Federal Works Agency for the Fiscal Year Ended June 30, 1942.* Washington, D. C.: Superintendent of Documents, Government Printing Office, 1942. 156 p.
19. FEDERAL WORKS AGENCY. *War Public Works: A Compilation of Statutes, Executive Orders, Regulations, and Other Documents Relating to the Construction, Financing, Operation, and Maintenance of Community Facilities under the Lanham Act, as Amended.* Washington, D. C.: Superintendent of Documents, Government Printing Office, 1943. 171 p.
20. HACKER, RALPH E. "School Buildings for the War Emergency." *American School Board Journal* 104: 54, 56, 69, 70; January 1942.
21. HILTON, OSCOOD. "Building Schools in a Boom Town." *Nation's Schools* 29: 14-17; June 1942.
22. HOLY, THOMAS C. "Economic Use of Supplies and Equipment." *Official Report of the Convention Never Held, Scheduled at St. Louis, 1943.* Washington, D. C.: American Association of School Administrators, National Education Association, 1943. p. 74-76.
23. JOHNSON, HUGH B. "It's Time to Face Facts on Furniture." *Nation's Schools* 30: 26-27; July 1942.
24. JOYAL, ARNOLD E. "Another Step toward Federal Control." *Nation's Schools* 29: 22-24; April 1942; 52-53, May 1942.
25. MICHAELIS, JOHN U. *An Appraisal of the Lanham Act School Program with Special Reference to the Problem of Federal Control over Public Education.* College Park: University of Maryland, 1943. (Doctor's thesis.)
26. MORPHET, EDGAR L. "We Have Federal Control of Education." *American School Board Journal* 107: 11-13; July 1943.
27. NATION'S SCHOOLS. "Lanham Act Administration." *Nation's Schools* 31: 9-10; January 1943.
28. NICHOLS, JOHN E. "Children's Centers and the Future." *American School and University.* New York: American School Publishing Corp., 1943. p. 177-83.
29. POWER, LEONARD. "Lessons from the Lanham Act for School Plant Design and Construction." *American School and University.* New York: American School Publishing Corp., 1944. p. 46-51.
30. REID, JOHN L. "Community Schools Built in Wartime: Yardsticks by Which We May Measure Progress." *American School and University.* New York: American School Publishing Corp., 1943. p. 26-32.
31. U. S. OFFICE OF EDUCATION. *Annual Report of the United States Commissioner of Education, 1941.* Washington, D. C.: Superintendent of Documents, Government Printing Office, 1942. 120 p.
32. U. S. OFFICE OF EDUCATION. *Annual Reports of the United States Office of Education, 1941-42, 1942-43.* Washington, D. C.: Superintendent of Documents, Government Printing Office, 1943, 88 p.
33. U. S. OFFICE OF EDUCATION. *Report on School Needs in Defense Areas.* Response to Senate Resolution 324 and submitted in Senate Document 20 to the U. S. Senate by the Secretary of War and the Acting Secretary of the Navy. Washington, D. C.: U. S. Office of Education, 1941. 34 p. (Mimeo. and photoprint.) (Out of print.)

CHAPTER VI

Plant Facilities for Vocational Education

WARD P. BEARD

ONE OF THE BASIC PRINCIPLES of vocational education is that buildings and equipment used in the training for an occupation should afford learning situations as nearly as possible like the working conditions in the occupation. Standards for buildings and equipment, therefore, have been determined largely by the kinds of buildings and equipment used in industry, in stores, on the farm, and in the home.

No record has been found of any literature of recent date bringing together and describing what might be considered standards for buildings and equipment in all fields of vocational education. This was done in 1921 in a chapter on "Buildings and Equipment for Vocational Schools" by J. C. Wright, assistant U. S. Commissioner for Vocational Education, in *School Architecture, Principles and Practices,* by John J. Donovan, a book published by the Macmillan Company.

This review reveals the need for (a) more objective research similar to that of Stayton (29) and Anderson (2); (b) introduction of experimentation instead of survey; and (c) use of objectives of courses as a major factor in determining equipment.

Agricultural Education

Bille (4) recommended standards for three types of vocational agriculture departments based upon the scope of their offerings. Room plans, including facilities for each of the three types of departments, were prepared. The most desirable types of equipment were illustrated and described. Layman (18) studied schools with an average enrolment of 105 boys and an average of 387 facilities valued at slightly less than $1000. On the basis of this study he made recommendations for classrooms and shops including facilities. Thurman (32) studied equipment lists for vocational agriculture departments in twenty states and developed suggested lists of equipment for such departments. Several states (1, 12, 20, 23, 37) described space, equipment, and layout and gave recommended lists of tools and equipment. The chief of the vocational agricultural education service (33) in a mimeographed letter of January 7, 1941, to state supervisors of agricultural education described and transmitted a drawing of a floor plan for a farm shop accommodating twenty to twenty-five pupils and providing for work in wood, concrete, metal, and electrical and general repair work.

Business Education

Kyker and Walker (17) discussed trends in vocational training for office occupations, giving a floor plan and list of equipment needed. Blackler (5) discussed model stores, school-store equipment, and selection of equip-

ment. Fisk (11) pointed out that business education requires less equipment than required for most other types of vocational education. Equipment was described for the several fields of business education. Criteria were outlined for selection of equipment.

Home Economics Education

Hunt (13) found that when thirty-one high-school home economics departments in Texas changed from a nonvocational to a vocational program, the change resulted among other things in more efficient business management. Stayton (29) determined by measuring 100 girls the optimum height of tables for girls standing and sitting at work and made recommendations for numbers of chairs and tables of each height if variable heights are to be used. She also made recommendations for adjusting heights and developed a design for a clothing laboratory table for both standing and sitting students. Anderson (2) derived dimensions for tables and cabinets used for high-school foods laboratory work by taking various measurements of 187 girls. Standards were developed for heights of working surfaces, 32½ inches; rim of sink, 37½ inches; pull-out board for beating, 30½ inches; minimum length of counter or table for two girls working side by side, 60 inches; maximum height of top drawer, 58 inches; and many other standards.

Dougherty (10) developed a list of specific utensils for each unit kitchen in a high-school homemaking department on the basis of questionnaire, interview, study of literature, and laboratory tests. A list of utensils for general use and storage in the homemaking laboratory was also developed. A third list included utensils desirable for demonstration purposes. A fourth list described in detail various utensils and gave uses, place of storage, and points to consider in selection.

O'Reilly (24) stated advantages and disadvantages of various locations, arrangements, and equipment for homemaking departments. Opinion was widely divided on all but a few questions indicating many unsolved problems and adaptation to a wide divergence of local situations. Several states (9, 14, 21, 34, 35) and a city (25) outlined plans for homemaking departments with drawings, pictures, lists of equipment, and floor plans. Blazier (6) related how rooms and equipment developed with curriculum revision.

Trade and Industrial Education

Struck (30) pointed out that the heavy use of equipment in the program of training workers for war industries affected selection of equipment and its care. He recommended live records on equipment, systematic inspection, breakage reports, proper supervision, and repair by instructors. Murri (19), Novascone (22), Karch (15), and Coleman and Oppermann (8) presented floor plans showing arrangement of equipment. Parkes (26) did the same for a factory type self-contained unit in a technical institute of the vocational-technical type.

Miscellaneous

Architectural Record (3) has reprinted material on a three-fold education program covering industrial arts, prevocational and vocational training giving plan types for each, case studies of four vocational schools, floor plans and a table showing floor area per student, illumination needs and type of floor for each kind of room or shop. Chamberlain's survey (7) showed data in regard to floor areas, value of equipment including extent and kind of power machines. Roehl (28) described a shop suitable for teaching general repair work in a rural community, giving floor plan and other description. The Wilmington Board of Education (36) published a brief description with pictures and floor plans.

Komow (16) developed a formula for computing number of shops. He recommended a maximum of twenty-five pupils per shop, length of shop never more than twice the width, located on ground floor away from other departments, and equipment the latest in use in industry.

Rawlins (27) used the questionnaire, critical reading, and experimentation to determine the status of lighting in some school shops in Ohio to find the reaction of pupils to ideal lighting recommendations as made by authorities, and to determine ideal lighting conditions for an industrial arts shop. He found many school shops inadequately lighted, made recommendations for good lighting practice, and found that pupils are dissatisfied in working under poor illumination and in most instances the pupils utilized light of higher intensities than those recommended by experts. He called attention to the need of educating school authorities on the neglect of shop lighting. Wright (38) found the lighting and ventilation of shops in East Texas inadequate.

The regents of the University of the State of New York (31) outlined needs and proposed building program for "Agricultural and Technical Institutes and the Maritime Academy," and for new "Institutes of Applied Arts and Sciences."

Bibliography

1. AGRICULTURAL AND MECHANICAL COLLEGE OF TEXAS. *Farm Shop.* Special Helps Bulletin No. 7. College Station, Texas: the College, 1940. p. 29.
2. ANDERSON, DORIS. *Dimension Standards for a High School Foods Laboratory.* Corvallis, Oreg.: Oregon State College, 1942. (Master's thesis.)
3. ARCHITECTURAL RECORD. *Vocational Schools.* Reprint on Building Types. 1940. p. 89-120.
4. BILLE, RALPH O. *Plans and Equipment for Agricultural Rooms.* Minneapolis, Minn.: Library, Department of Agricultural Education, University of Minnesota, 1940. 67 p. (Master's special study.)
5. BLACKLER, WILLIAM R. "Equipment in Distributive Education." *American School and University.* New York: American School Publishing Corp., 1941. p. 381-86.
6. BLAZIER, FLORENCE E. "Planning a Combination Homemaking Room." *American School Board Journal* 108: 33-38; February 1944.
7. CHAMBERLAIN, DUANE. "Floor Areas and Equipment in Small High School Shops." *Industrial Arts and Vocational Education.* Graduate study. Ypsilanti, Mich.: Michigan State Normal College 31: 130-31; March 1942.

8. COLEMAN, JOHN B., and OPPERMANN, W. F. "Trades and Industries Building at La Crosse." *Industrial Arts and Vocational Education* 30: 85-90; March 1941.
9. DEPARTMENT OF PUBLIC INSTRUCTION, COMMONWEALTH OF PENNSYLVANIA. *Homemaking Cottages.* Bulletin 322. Harrisburg, Pa.: the Department, 1939. 42 p.
10. DOUGHERTY, ARDYTHE W. *Determining a Standard Set of Utensils for a High School Homemaking Laboratory.* Corvallis, Oreg.: Oregon State College, 1942. (Master's thesis.)
11. FISK, MCKEE. "Equipment Needs in Junior College Business Education." *American School and University.* New York: American School Publishing Corp., 1941. p. 372-80.
12. GEORGIA STATE BOARD FOR VOCATIONAL EDUCATION. *Establishing, Operating, and Using School Community Canning Plants.* Special Bulletin No. 11. Atlanta: the Board, April 1943. p. 78.
13. HUNT, MARY R. *Some Effects on Curriculum, Equipment, and Pupil Growth of Changing from Non-vocational to Vocational Home Economics.* Ames, Iowa: Iowa State College, 1940. 115 p. (Master's thesis.)
14. KANSAS STATE BOARD FOR VOCATIONAL EDUCATION. *How to Establish and Equip a Department of Vocational Homemaking in the Public Schools of Kansas.* Topeka, Kans.: the Board, 1941. 23 p.
15. KARCH, ROBERT R. "Equipping the School Printing Department." *Industrial Arts and Vocational Education* 31: 151-54; April 1942.
16. KOMOW, MAXIMILLAN. "The Planning of Vocational Departments in High Schools." *American School Board Journal* 108: 25-27; January 1944.
17. KYKER, B. FRANK, and WALKER, ARTHUR L. "Some Trends in Business Education." *Office Appliances,* p. 3, May 1944.
18. LAYMAN, JOHN C. *A Study to Determine a Practical Plan and Arrangement for Vocational Agriculture in Charlotte County, Virginia.* Blacksburg, Va.: Virginia Polytechnic Institute, 1940. 132 p. (Master's thesis.)
19. MURRI, JOSEPH. "Layout and Equipment for a Vocational Radio Shop." *Industrial Arts and Vocational Education* 32: 120-23; March 1943.
20. NORTH CAROLINA STATE COLLEGE OF AGRICULTURE AND ENGINEERING, DIVISION OF TEACHER TRAINING. *Farm Shop Activities and Equipment for Students of Vocational Agriculture.* Agriculture Teacher Series, Bulletin 4. Raleigh, N. C.: North Carolina State College, March 1940. p. 65.
21. NORTH CAROLINA STATE DEPARTMENT OF PUBLIC INSTRUCTION, VOCATIONAL DIVISION. *Space and Equipment for Home Economics Departments in North Carolina High Schools.* Raleigh, N. C.: the Department. VH-785. 27 p. (Mimeo.)
22. NOVASCONE, F. L. "Aircraft Riveting and Assemblying Course." *Industrial Arts and Vocational Education* 31: 102-104; March 1942.
23. OKLAHOMA STATE BOARD FOR VOCATIONAL EDUCATION. *A Vocational Agriculture Shop.* State Department of Education. Stillwater, Okla.: the Department, 1941. p. 2.
24. O'REILLY, JUSTINE B. *Opinions of Home Economics Leaders Concerning Locating, Arranging and Equipping Homemaking Departments.* Corvallis, Oreg.: Oregon State College, 1942. (Master's thesis.)
25. PALMER, FLORENCE. "Facilities for Teaching Home Economics." *American School and University.* New York: American School Publishing Corp., 1941. p. 422-28.
26. PARKES, GEORGE H. "War Training Machine Shop." *Industrial Arts and Vocational Education* 32: 115-16; March 1943.
27. RAWLINS, CHARLES W. *The Status of Lighting in Some School Shops in Ohio and Recommendations for Improved Lighting.* Athens, Ohio: Ohio University, 1940. 112 p. (Master's thesis.)
28. ROEHL, LOUIS M. "Community Repair Shop." *Industrial Arts and Vocational Education* 32: 123-25; March 1943.
29. STAYTON, MARY E. *Heights of High School Clothing Laboratory Tables Based on Measurements of 100 Girls.* Corvallis, Oreg.: Oregon State College, 1939. (Master's thesis.)
30. STRUCK, F. THEODORE. "Maintaining School Shop Equipment Under the Defense Training Program." *American School and University.* New York: American School Publishing Corp., 1942. p. 405-10.

31. THE UNIVERSITY OF THE STATE OF NEW YORK. *Regents Plan for Postwar Education in the State of New York.* Albany, N. Y.: the State Department of Education, 1944. p. 64.
32. THURMAN, ROBERT L. *A Study of the Equipment for Texas Vocational Agriculture Departments, Including Suggestions.* Lubbock, Texas: Department of Agricultural Education, Texas Technological College, 1939. 53 p.
33. U. S. OFFICE OF EDUCATION. *Suggested Floor Plan for a Farm Shop.* Washington, D. C.: Superintendent of Documents, Government Printing Office, 1941. 4 p. (Mimeo and offset.)
34. VIRGINIA STATE BOARD FOR VOCATIONAL EDUCATION. *Equipment Suggestions for High School Home Economics Departments.* Richmond, Va.: the Board. 11 p. (Mimeo.)
35. WILLIAMS, FRANK. "Planning Homemaking Departments." *American School and University.* New York: American School Publishing Corp., 1942. p. 339-44.
36. WILMINGTON BOARD OF EDUCATION. "School for 800 Pupils Has Unusual Site: H. Fletcher Brown Vocational High School, Wilmington, Delaware." *Architectural Record* 87: 101-103; April 1940.
37. WILSON MANNIE R. *Buildings and Equipment for Vocational Agriculture Instructruction.* Bulletin of the Engineering Experiment Station, Vol. 22, No. 3. Manhattan, Kans.: Kansas State College, 1938. 32 p.
38. WRIGHT, WELCOME E. *An Analysis of the Lighting and Ventilation of Industrial Arts Laboratories in East Texas.* College Station, Texas: Agricultural and Mechanical College of Texas, 1939. (Master's thesis.)

CHAPTER VII

Plant Facilities for Higher Education

E. T. PETERSON

SINCE THE SECTION on Plant Development for Higher Education was omitted in the last school plant issue of the REVIEW OF EDUCATIONAL RESEARCH, this chapter reviews the literature beginning in April 1938. Work in this field continues to be characterized by relatively few substantial investigations and by numerous articles which describe and analyze individual college building projects. No attempt has been made to include all material in the second group. Representative projects illustrating various types of college buildings have been selected and reviewed. In most cases the planning of these projects gives evidence of more research of an informal nature than is apparent on casual inspection.

There is encouraging evidence that functional planning is increasing at the college level. There is less conformity to rigid and uniform campus architectural schemes usually dominated by extremely traditional types. There is more emphasis on detailed determination of educational requirements and on honest, direct, and consistent translation of requirements into design and treatment. The lesson seems at last to have been learned that this procedure need not sacrifice aesthetic values.

For readers unfamiliar with the college plant field, it may be observed that the *American School and University* continues to devote more attention to building problems in higher education than any other periodical.

General

Evenden, Engelhardt, and Strayer (12) published an extremely significant volume, extending to college buildings their series of standards for various types of school buildings and designed for use with their score card technic. The major sections were site, buildings, service systems, instruction rooms, and general units. A supplementary set of standards was included for teachers colleges. These standards bring together the results of scattered research and the composite judgments of competent educators, architects, and technicians in a systematic sequence which facilitates use in both evaluation of existing plant and in the planning and construction of new units

A shift from traditional and uniform college classrooms to rooms of individual character planned to meet specific purposes was advocated by Harrison (19). He illustrated his ideas by drawings of a student forum unit, a mathematics suite, a science laboratory, a lecture room, a project and seminar room, and a language room.

Campus Plans

Smith (37) presented four comprehensive university campus plans at Illinois, Michigan, Ohio State, and Wisconsin. He analyzed needs in three

stages: (a) a relatively small program for immediate postwar execution; (b) a secondary postwar program planned for execution as funds are available; (c) indefinite future construction. He emphasized the importance of coordinated planning of space provisions for three new areas—radio, nutrition, and international relations.

Several college campus plans were discussed by Hill and Taylor (20) with emphasis on principles of landscape development.

Patterson (34) described the first two buildings on the new campus of the University of Houston. The first quadrangle is being developed around a reflecting pool. Buildings are air conditioned.

Libraries

Hanley (16) presented floor and section plans, photographs, and brief descriptions of forty-two college and university library buildings. Emphasis was on functional planning. Included was a brief discussion of essentials in library planning and a summary chart of comparative cost and size data and a comprehensive, annotated bibliography.

Walter (45) considered the general problems involved in university library planning with illustrations from the libraries at Dartmouth College and the universities of Colorado, Minnesota, Utah, and Yale.

A new approach was suggested by Ellsworth (8) with emphasis on maximum flexibility and continuous adjustment to the instructional program—the learning laboratory, not the monumental building. A development of the unit plan was proposed with low ceiling heights and a skeleton of steel columns carrying movable partitions or shelving. The idea was illustrated by a detailed description of provisions for a social studies area.

Science and Industrial Buildings

Cocking (4) summarized nineteen articles on planning and servicing science laboratories appearing in the *American School and University* from 1930 to 1943, ranging from a single building housing all sciences to the Technological Institute at Northwestern University.

The new Technological Institute at Northwestern University, which houses civil, chemical, electrical, and mechanical engineering and the departments of physics and chemistry was described in detail in three articles by staff members (11, 33, 39). The building has a volume of 5,000,000 cubic feet, and the floor area is 450,000 square feet. A complete set of floor plans is reproduced. Of special interest are the detailed descriptions of the highly specialized research laboratories in physics and chemistry, which reflect an enormous amount of careful planning. Fluorescent lamps provide illumination of twenty-five foot-candles on the tables. There is an unusually attractive and functionally designed lecture-demonstration room with 200 seats arranged in quarter circles on graduated steps.

The architects, Holabird and Root (21), presented a well-illustrated discussion of the special features, including "the quietest room in the world," a room "where it always rains," a two-and-one-half story laboratory with

a million pound transverse-universal testing machine, cold rooms, and so forth. The drawings included a combined elevation and section.

Burns (2) described the new science building at Appalachian State Teachers College. The planning was characterized by carefully organized staff participation which included specially designed equipment.

The floor plans and course offerings of the new industrial division plant of Santa Barbara State College were described by Ericson (9).

Theaters, Art, and Music

Hare (18) assembled extremely valuable planning data and standards on theater design, stage requirements, lighting and acoustic planning. Complete case studies were presented of the University Theater, University of Iowa, and of the Theater Wing, Wisconsin Union, University of Wisconsin.

Cole (5) analyzed the floor plans and facilities of the Kirby Memorial Theater at Amherst College and the Adams Memorial Theater at Williams College. Both were designed as theaters with no direct attention to multiple use. The analysis is keyed at every point to the problems of play production in a college theater.

Scholer (36) gave a complete description, with photographs, plans, and isometric section, of the Hall of Music, Purdue University, the largest building of its kind in the country. The auditorium seating capacity is 6208. Excellent provisions are included for campus musical organizations, radio studios, and auxiliary rooms.

An unusual grouping of facilities for architecture, fine arts, and art galleries at the University of Southern California was described by Flewelling (15).

Physical Education

Houston (23) visited the women's physical education departments of forty-eight colleges and universities and studied intensively the programs of activities and the school plant facilities of seven large institutions. The study included an excellent review of the developing housing program, and the analysis of facilities in seven colleges was enriched by nearly a hundred photographs and a large number of floor plans. This study received the honor award of the American Academy of Physical Education. An excellent summary of the findings and recommendations was published in the *American School and University* (24).

Mitchell (32) summarized wartime emphasis and trends in college physical education and indicated areas of carry-over after the war as obstacle courses, running and swimming facilities, camping, more complete health examinations, and correctives. He proposed changes in locker and shower room design, simpler roof structure, increased use of the stadium, better sanitary facilities, more attention to play area surfaces, and more complete instructional equipment.

Diemer (7) reviewed the facilities of a carefully planned health and

physical education unit at Central Missouri State Teachers College. The problems presented by coeducational use of the structure in a teacher training program were solved with unusual success.

Loebs (30) presented a detailed planning procedure for corrective exercise rooms with a condensed statement of standards and a check list of equipment.

Fetzer and Cornwell (13) gave a detailed summary of the specifications and layout of the new $600,000 gymnasium at the University of North Carolina. Special features were the flexibility of use of the large gymnasium, 150 feet by 250 feet, the ample provision of smaller specialized rooms, and an excellently planned pool.

Residence Halls

Cocking (3) reviewed sixteen articles on dormitory planning and operation in issues of the *American School and University* from 1930 to 1943. He noted a decided shift in function from mere housing to the provision of a varied educational living environment.

Ingemann (26) summarized the results of a questionnaire on types of accommodations best suited for girls' dormitories in twenty-seven colleges. Opinions favored dividing into groups of not over sixty with single study bedrooms opening on corridors rather than around individual stair halls.

Based on his experience in designing recent dormitories at Ohio State University, Smith (38) analyzed eight projects ranging from $650 to over $2000 in cost per occupant with practical suggestions of the limitations imposed on facilities by budget requirements, both in planning and operation.

Trautman (42) described a new dormitory at Baldwin-Wallace College to house sixty-three men. Special attention was devoted to specifications which minimize maintenance problems.

Johnston and Jones (29) presented the floor plans of a compactly designed apartment building for married graduate students and instructors on the agricultural school campus of the University of Minnesota; cost $160,000, capacity thirty-six apartments. This type of facility will be in great demand in a number of institutions in the postwar period.

The close relationship between proper planning of residence halls and their operation and management was stressed by Hunter (25). Rollins (35) reviewed the experience of Northwestern University in planning dining halls, kitchens, and cafeterias. Included are planning suggestions, equipment standards, and useful hints in operation. Terrell (40) emphasized the importance of identifying the work to be performed as a basis for successful planning of residence-hall kitchens. Well-planned units were illustrated by photographs. Based on an installation of food-service equipment at Syracuse University, Webber (46) outlined the specifications and functional arrangement of a food counter with many labor saving and automatic devices.

Teacher-Training Facilities

Ballard (1) reviewed the facilities of the school of education building at Stanford University, the gift of former Dean Cubberley and planned by him.

Holmstedt (22) presented the special features designed to adjust to a teacher-training program in the new university school at the University of Indiana. The school is a complete unit, nursery school, and elementary and high schools organized on the 6-6 plan.

Operation and Maintenance

Whitney (47) described the derivation and use of certain measures of boiler efficiency, emphasizing BTU, unit evaporation, fuel fired, and steam consumed. In computing heating plant unit costs, he suggested steam produced fuel, wages, and repairs. In studying electric light and power load, he employed a time series analysis with charts of daily, weekly, and seasonal load curves.

Veech (43) reviewed the reorganization of the maintenance program at Washington and Lee University with emphasis on periodic, systematic inspection reports.

Miscellaneous

Coleman's study of museums (6) was sponsored by the Carnegie Corporation and was based on visits to 200 colleges and universities. It was richly illustrated by photographs and floor plans. Art, science, and history museums received separate treatment, and the discussion of the function of museums in institutional programs is replete with helpful suggestions in planning and design.

The facilities of the Coffman Memorial Union at the University of Minnesota were described and illustrated by Johnston and Jones (27). This $2,000,000 structure with 280 rooms meets all the requirements of a student campus center and contains a faculty club.

The needs of students with minor ailments and the needs for observation and isolation were provided for in a Health Service Building on the St. Paul campus of the University of Minnesota. This building was described by Johnston and Jones (28).

Evans, Moore, and Woodbridge (10) presented plans and photographs of a highly specialized alumnae building at Smith College including a social club, conference halls, and offices. Wahl (44) reported the highly specialized facilities incorporated in the new medical research laboratory at the University of Kansas. Magrath (31) described a project of alteration and enlargement of the business offices at the University of New Hampshire. Plans were described by Thayer (41) for a college greenhouse which includes a student laboratory.

Junior Colleges

Hardesty (17) discussed library utilization in the instructional program of the junior college and made suggestions for location, space, lighting,

acoustics, and equipment. Fisk (14) based his discussion on an analysis of equipment in use and desired in occupational business courses in forty junior colleges. He illustrated by numerous photographs the battery and the rotary plan of equipment installations, the production laboratory, the retailing classroom, and the model office.

Bibliography

1. BALLARD, BERTON J. "A Great Schoolman Builds a School." *American School Board Journal* 98: 56-58; January 1939.
2. BURNS, ZED H. "A Science Building for a Teachers College." *American School and University*. New York: American School Publishing Corp., 1941. p. 482-89.
3. COCKING, WALTER D. "College Dormitories." *American School and University*. New York: American School Publishing Corp., 1944. p. 95-96.
4. COCKING, WALTER D. "College Science Plant Facilities." *American School and University*. New York: American School Publishing Corp., 1944. p. 104-107.
5. COLE, EDWARD C. "Two Theatres for American Colleges." *American School and University*. New York: American School Publishing Corp., 1941. p. 295-300.
6. COLEMAN, LAURENCE V. *College and University Museums*. Washington, D. C.: American Association of Museums, 1942. 73 p.
7. DIEMER, GEORGE W. "The Morrow Health and Physical Education Building." *American School and University*. New York: American School Publishing Corp., 1942. p. 218-21.
8. ELLSWORTH, RALPH E. "Planning a University Library." *American School and University*. New York: American School Publishing Corp., 1944. p. 97-99.
9. ERICSON, EMANUEL E. "Santa Barbara's New Industrial Division." *Industrial Arts and Vocational Education* 30: 419-21; December 1941.
10. EVANS, MOORE, and WOODBRIDGE. "Alumnae House, Smith College." *Architectural Forum* 70: 3-8; January 1939.
11. EVANS, WARD V. "The New Northwestern Chemical Laboratory." *American College and University*. New York: American School Publishing Corp., 1943. p. 274-78.
12. EVENDEN, EDWARD S.; ENGELHARDT, NICKOLAUS L.; and STRAYER, GEORGE D. *Standards for College Buildings*. New York: Teachers College, Columbia University, 1938. 226 p.
13. FETZER, ROBERT A., and CORNWELL, OLIVER K. "The New Gymnasium at the University of North Carolina." *American School and University*. New York: American School Publishing Corp., 1940. p. 265-71.
14. FISK, MCKEE. "Equipment Needs in Junior College Business Education." *American School and University*. New York: American School Publishing Corp., 1941. p. 372-80.
15. FLEWELLING, RALPH C. "Fine Arts Buildings." *Architectural Record* 87: 39-43; April 1940.
16. HANLEY, EDNA R. *College and University Library Buildings*. Chicago: American Library Association, 1939. 152 p.
17. HARDESTY, CECIL D. "Planning the Junior College Library." *American School and University*. New York: American School Publishing Corp., 1940. p. 308-12.
18. HARE, MICHAEL M. "Bases of Design for Community Theatres." *Architectural Record* 86: 78-104; October 1939.
19. HARRISON, WALLACE K. "Better Planning for College Classrooms." *American School and University*. New York: American School Publishing Corp., 1939. p. 288-91.
20. HILL, CHANCE S., and TAYLOR, ALBERT D. "Principles Governing the Landscape Development of Grounds for Educational Institutions." *American School and University*. New York: American School Publishing Corp., 1939. p. 203-15.
21. HOLABIRD and ROOT. "The Technological Institute of Northwestern University." *Architectural Record* 92: 37-44; August 1942.
22. HOLMSTEDT, RALEIGH W. "A Modern School Plant for Training Teachers." *American School and University*. New York: American School Publishing Corp., 1942. p. 49-56.

23. HOUSTON, RUTH E. *Modern Trends in Physical Education Facilities for College Women.* New York: A. S. Barnes and Co., 1939. 198 p.
24. HOUSTON, RUTH E. "Physical Education Facilities for the College Women of Tomorrow." *American School and University.* New York: American School Publishing Corp., 1940. p. 246-55.
25. HUNTER, MELISSA. "How Proper Building Design and Equipment Can Lessen the Problems of Residence Hall Managers." *American School and University.* New York: American School Publishing Corp., 1939. p. 409-12.
26. INGEMANN, WILLIAM M. "Dormitory Planning—1941." *American School and University.* New York: American School Publishing Corp., 1941. p. 432-37.
27. JOHNSTON, C. H., and JONES, ROY. "Coffman Memorial Union." *Architectural Record* 90: 41-54; September 1941.
28. JOHNSTON, C. H., and JONES, ROY. "Health Service Building." *Architectural Record* 90: 56; September 1941.
29. JOHNSTON, C. H., and JONES, ROY. "Thatcher Hall." *Architectural Record* 90: 55; September 1941.
30. LOEBS, GILBERT F. "Planning and Equipping the Corrective-exercise Gymnasium for the Modern College or University." *American School and University.* New York: American School Publishing Corp., 1942. p. 222-27.
31. MAGRATH, RAYMOND C. "Layout and Equipment of a University Business Office Enlarged to Meet New Needs." *American School and University.* New York: American School Publishing Corp., 1942. p. 298-303.
32. MITCHELL, ELMER D. "College Physical Education Facilities for War and Peace." *American School and University.* New York: American School Publishing Corp., 1943. p. 152-59.
33. NORTHWESTERN UNIVERSITY. "Laboratory Facilities—Physics and Chemistry—at Northwestern University." *American School and University.* New York: American School Publishing Corp., 1943. p. 267-70.
34. PATTERSON, N. S. "University of Houston Building Program." *American School Board Journal* 102: 38-40; June 1941.
35. ROLLINS, J. LESLIE. "Efficient Cafeteria and Kitchen Layouts for College Residence Halls." *American School and University.* New York: American School Publishing Corp., 1942. p. 333-38.
36. SCHOLER, WALTER. "The Hall of Music at Purdue University." *American School and University.* New York: American School Publishing Corp., 1941. p. 316-21.
37. SMITH, HOWARD D. "Planning for Post-war College and University Construction." *American School and University.* New York: American School Publishing Corp., 1944. p. 36-45.
38. SMITH, HOWARD D. "The Designing of College Dormitories." *American School and University.* New York: American School Publishing Corp., 1940. p. 421-34.
39. SPENCE, BARTHOLOMEW J. "The New Physics Laboratory at Northwestern." *American School and University.* New York: American School Publishing Corp., 1943. p. 270-74.
40. TERRELL, MARGARET E. "Planning Kitchens for Residence Halls." *American School and University.* New York: American School Publishing Corp., 1939. p. 413-18.
41. THAYER, CLARK L. "New Greenhouse Equipment at the Massachusetts State College." *American School and University.* New York: American School Publishing Corp., 1940. p. 498-99.
42. TRAUTMAN, PAUL R. "A Low-cost Residence Hall for Men." *American School and University.* New York: American School Publishing Corp., 1942. p. 349-51.
43. VEECH, J. ALEXANDER. "Maintenance of Buildings and Grounds at Washington and Lee University." *American School and University.* New York: American School Publishing Corp., 1940. p. 177-81.
44. WAHL, HARRY R. "The Hixon Laboratory for Medical Research." *American School and University.* New York: American School Publishing Corp., 1940. p. 489-95.
45. WALTER, FRANK K. "The University Library Building." *American School and University.* New York: American School Publishing Corp., 1941. p. 307-15.
46. WEBBER, OWEN. "Fine Points of Food-service Equipment Design." *American School and University.* New York: American School Publishing Corp., 1940. p. 438-41.
47. WHITNEY, FREDERICK L. "Heating and Lighting Efficiency on a College Campus." *American School and University.* New York: American School Publishing Corp., 1943. p. 89-92.

CHAPTER VIII

School Plant Lighting

CHARLES D. GIBSON

BECAUSE OF THE WAR IMPACT and its restrictive implications for electrical materials and equipment, very little of the research or very few of the significant publications available for review dealt with artificial lighting. This circumstance probably was one of the better things resulting from the war, as it gave an opportunity for accent on the present and developing role of daylight as the major light source for schools.

The Present Status of School Lighting

A report by Dates (8) summarized the story of improved school lighting from 1918 to 1940. This report also recorded the results of a survey made in 1940 to determine the progress in school lighting and to create a picture of lighting practices in classrooms over the United States. Data were gathered representing some 250,000 classrooms in forty states and the District of Columbia, about 20 percent of the nation's schoolrooms.

Some of the results of this nationwide survey were indicative of the status of school lighting in 1940. Because of war-created restrictions on lighting equipment, the results of a 1940 survey still are acceptable in 1944. The survey indicated that:

1. Twelve percent of all school lighting installations met the specifications of the 1938 American recommended practice of school lighting.
2. Sixty-six percent of the installations in new schools conformed to these specifications.
3. Sixty-seven percent of the relighting jobs during the 1939-40 school year conformed to these specifications.
4. The average intensity of illumination in the schoolrooms was about seven foot-candles.
5. Type of luminaries in use were as follows:

	Percent
a. Indirect	5
b. Semi-indirect	10
c. General diffuse i.e. enclosing globes	70
d. Direct	15

It may be noted, however, that in the Texas School Adequacy Survey only 3193 of the 11,060 schools included had electricity (6).

The Trend

One of the most significant developments in the lighting field during the past few years has been the shift of emphasis from foot-candle intensities to considerations of brightness, brightness contrast, and brightness ratios as the controlling factors in the maintenance of good seeing conditions. Taylor (33) stated that brightness and brightness contrast are the

most fundamental factors affecting seeing and are actually the end products of illumination. He worked out tables which illustrated the range of brightness encountered in natural and artificial lighting and described in detail the instruments now available to measure brightness.

Luckiesh (24) sounded the warning "Beware of the limitations of foot-candles. They are a measure of the level of illumination but they alone do not determine the brightness. And brightness is a controlling factor in lighting for comfortable seeing."

Harrison and Luckiesh (13) stated that for years it has been recognized that comfort in lighting is, for the most part, a matter of quality of lighting or "distribution of brightness in the entire visual field."

Reporting on the results of a survey that covered many of the electrical industries in the United States, Williams (35) stated that "The level of lighting (intensities) seemed to interest a substantial part of the people who gave me information *much less* than the quality. This is a fine trend. . . ."

Luckiesh (23), at one time, struck the keynote in the change of emphasis in illuminating engineering and summarized the limited, significant research relating to brightness as the prime factor in the critical task of seeing. From a rather narrow foot-candle fetish, he indicated the trend as being toward a wider and certainly a more scientifically defensible consideration of brightness and its many ramifications. This article developed the thesis that "a visual task is inseparable from its environment," and that "the distribution of brightness in the visual field determines the seeing conditions."

Brightness Contrast and Brightness Ratio

The terms "brightness contrast" and "brightness ratio" have been used interchangeably in much of the lighting literature. Luckiesh (23) by definition and illustration, drew a logical, clarifying difference between these two terms which undoubtedly will do much toward bringing more needed explicitness into discussions in this field.

Brightness Limits

Fowler and Crouch (10) covered the subject of brightness limits for lighting systems. These men established basic formulas by correlating many noteworthy researches, particularly by Holladay, Luckiesh, Meaker, Nutting, and Potter. These scientifically established formulas were then translated into practical applications.

An acceptable range of brightness for adjacent areas in a visual field was recommended by Harrison and Luckiesh (13) to be between 10 to 1 and 50 to 1. Luckiesh (23) defined the limits of acceptable brightness contrast and ratios and applied his formula to typical visual fields and seeing tasks. Brown (2) advocated the brightness ratio of 100 to 1 as the acceptable maximum.

Brightness and Glare

Glare is defined by Fowler and Crouch (10) "as any brightness within the field of vision of such character as to cause discomfort, annoyance, interference with vision or eye fatigue." Direct and reflected glare are defined, analyzed, and discussed. The "relativity" of glare as evidenced by brightness contrast is developed in a comprehensive way. A summary of the various researches dealing with the reduction of visibility due to glare states that "there is practically a unanimous finding that the reduction of visibility due to the presence in the field of view of a bright light source increases with the increase of candlepower of the glare source; decreases with increase of angle of departure of the glare source from the visual axis; and decreases with increase of brightness of the surrounding adapting field."

Brightness and Color

The shift in emphasis to brightness, brightness contrast, and brightness ratios as the controlling factors in adequate illumination called added attention to color and its contribution to school lighting. Moon (27) listed reflection factors and trichromatic coefficients of eighty-seven commercially available wall materials. He also set up and reported experiments using materials of different reflection factors on walls and floors while maintaining a matte white ceiling with a reflection factor of 80 percent. Moon concluded that the lighting effect of high reflection factors for wall areas may be fully as great as the effect of the ceiling, particularly for rooms with relatively high ceilings. He summarized his findings and stated, "Not only do highly reflecting walls allow a more economical lighting installation for the same illumination on the work, but what is perhaps more important—they reduce contrasts and tend toward a more pleasing psychological effect."

Ickes (19) discussed the importance of color and reflection factors of walls and ceilings in relation to types of light sources. He compiled a chart which gives an appraisal of wall colors viewed under various light sources and illuminated to normal brightness. Bursch (4) discussed this subject quite fully and in the discussion injected an extension of interest in color to include recommendations for furniture and chalk boards of higher reflection factors. If the necessity for reasonable brightness contrasts and ratios are accepted, interest and action regarding color in schoolrooms must include considerations of higher reflection factors of woodwork, furniture, floors, and equipment, as well as of walls and ceilings. Luckiesh (24) declared that in order to provide good seeing conditions the architect must deal with the whole interior, not just the working plane.

Hynds and others (18) made a contribution to the field of lighting and color thru a cooperative, interdepartmental study in the New York City schools. Five basic color schemes for ceilings, walls, dadoes, and baseboards were worked out and six other combinations interrelating the five basic schemes were suggested.

Daylighting and Classroom Design

One of the most marked trends in school lighting during the past few years has been the modification of classroom design to permit the greater use of daylight as a light source. Haskell (14) described and illustrated sixteen ways of daylighting classrooms. The classroom designs he discussed and illustrated were conceived to make possible a more even distribution of light intensity (foot-candles) between the inmost row of desks and the row next to the windows.

The cross sections of classrooms presented by Haskell illustrated both the modified unilateral and the bilateral technics of daylighting. The evidence given indicated the proper use of each method in buildings of different types. It is significant to note that not one of the sixteen illustrations showed a traditionally designed classroom with a flat ceiling receiving light only from one bank of large windows.

Haskell discussed such other important lighting factors as methods of controlling daylight; brightness as a prime factor in critical seeing; orientation of buildings; square floor plans for classrooms; directional glass block lighting technic; sloped ceilings; and solar heating. A summary of daylighting factors, including those presented by the general environment and by building design, was given at the end of the article.

Brown (2) gave an over-all review of the many factors involved in proper illumination of schoolrooms. His article, studied in relation to Haskell's data (14), presented the case for daylighting in classrooms. Brown stressed the great importance of properly illuminating the area surrounding the seeing task and recommended that a brightness contrast of two to one be maintained between the seeing task and the immediate surroundings for effective seeing conditions. He presented his specifications for a classroom designed for high-level daylight illumination.

In the support of planning the postwar school to take every possible advantage of design for daylighting, Nichols (28) stated that altho natural lighting in schools never has been entirely satisfactory, it still is preferable to any practicable artificial lighting so far devised.

Reid (32) exhibited sketches which indicated the distribution of daylight in rooms using both unilateral and bilateral technics. He also presented evidence to show that superior daylighting made possible by the bilateral system was responsible for the development of one-story, north-oriented, high-school plants now in use. Perkins (30) compared graphically the daylight contours in a standard classroom having unilateral lighting with the daylight contours in a classroom constructed for the use of bilateral lighting.

Those responsible for school plans are becoming aware of the need for greater window areas in the modern school than were provided in the past according to Higgins (16). He reported that bilateral lighting is again being introduced into school planning by means of clearstory lighting on the opposite side of the room from the main fenestration.

Bursch (4) asserted that "classroom planning, working under the requirement of a given classroom span or of unilateral lighting, is strait-jacketed."

Englehardt and associates (9) prefaced their study of elementary classrooms with the observation that the character of the building plan has dictated the use in the past of rectangular shaped classrooms and unilateral lighting. He maintained that these characteristics of classrooms are not necessarily good because they have been followed universally and that the state laws setting up rigid requirements regarding size, lighting, and so forth of classrooms should, in the future, "be more general in nature and less restrictive in details."

Dalle Valle (7) worked out a nomograph and table which furnish a "simple means" for obtaining answers to the following problems: How much daylight illumination will be provided by windows of a given size? How many windows must be provided in a room to secure a given amount of daylight illumination?

Control of Daylight

The acceptance of brightness and brightness contrast as the prime factors in illumination for critical seeing-tasks, and the new interest in bilateral lighting and large window areas, have accented the problem of daylight control. Recent research and practice have developed two distinct brightness control methods. The one method is based on building orientation, the other method makes use of over-all louvering of glazed areas. Both of these brightness control methods, plus many adaptations of features of each method, were illustrated by Haskell (14) and discussed by Brown (2).

The fixed louver method of daylight control eliminated the factor of orientation in building planning according to Wright (38) and made possible acceptable brightness ratios within the classrooms. This technic requires the use of supplementary artificial lighting to a greater extent than does the "orientation" technic.

In defense of control by orientation, Bursch (4) declared that "north classrooms with little or no attention to shading, produce a higher level of illumination with lower brightness contrasts than can be produced with perfectly adjusted shades of the best known types for classrooms with sunny exposures."

The uses of other methods of daylight control, such as venetian blinds, shades, and so forth, were discussed by Haskell (14) in his summary of daylighting factors. Caudill (6) stated that shades and blinds which must be regulated continually by the teacher should never be used in classrooms. He favored roof-overhangs, awnings, and light louvers installed as permanent fixtures for daylight control.

Broom and others (1) reported much school lighting information and discussed and illustrated extensively arrangements of classroom furniture in relation to daylight sources. They also compiled a comprehensive bibliography on school lighting and conducted a lighting survey in the El Paso

city schools. Thompson (34) offered data to show that uncontrolled daylight (glare from window areas) was largely responsible for prevalent body malformations among school children. He found glare to be a major factor in visual fatigue and, because of resulting posture adjustments, a direct cause of spinal curvature. The remedy suggested was based on equalized, adequate illumination with controlled brightness and on adequate seating of pupils.

Radical departures from previously accepted fenestration standards should be made only after carefully considering the adaptability of the new natural lighting schemes to local climatic conditions.

What About Foot-candles

The conclusion that the amount of light needed to produce the most efficient work still is controversial (16) is the one point of agreement among "lighting experts." An "adequate" amount of light is recommended by everyone but the definition of "adequate" runs from five to five hundred foot-candles (6). The trend, as indicated by the "research" reported in this chapter, is definitely toward placing the emphasis in school lighting on brightness and brightness ratios with foot-candle intensities being an inseparable part of the larger term "brightness."

Perkins (29) decried the acceptance of fifteen foot-candles as a classroom standard of light intensity and suggested the use of the higher intensities found in natural environments. Bursch and others (5) sponsored thirty foot-candles as a "maintained" level of illumination for classrooms after having provided for higher "initial" levels. Brown (2) stated the case for one hundred foot-candles in classrooms in terms of new daylighting technics.

"We see with our bodies as well as with our eyes." This thesis was presented by Brownlee (3) as he indicted school planners with the statement "The greatest threat to healthy eyes lies in the poor lighting facilities to be found in many of our classrooms." He urged the use of daylight or artificial light or any combination of the two to provide adequate insurance against low levels of light because of the eyestrain it produced in children.

After Holy (17) had explored the field of lighting in relation to health, he concluded that it seemed reasonable to assume that poor lighting has an injurious effect on children's eyesight. An ophthalmologist (36) entered the field with the statement "Real harm to the eyes can be caused by insufficient illumination." The matter of how much light brought forth the endorsement of fifteen foot-candles as a minimum standard along with the opinion that the matter of maximum intensities could be overdone.

Rahn (31) warned that school executives who believe they are saving the taxpayers' money by cutting down on lighting are "endangering the eyesight of children and handicapping their opportunity to learn." He presented a check list which can be used by the teacher in managing classroom illumination.

Foot-candle Trends

On the basis of a 1940 survey (8), the national average lighting level in classrooms is seven foot-candles. Averages by states were reported in this same survey to range from three to thirteen foot-candles with some individual school systems having lighting levels of from fifteen to thirty-five foot-candles. This phase of the survey was summarized as follows: "The national average is slowly but steadily rising but the new school buildings and relighting jobs conforming to specification are still too few in total numbers to offset the very large number of old installations not yet converted." Wright (39) predicted that "The higher intensities to which we have become accustomed during the war in production areas will step up lighting levels to a point equal to ten average peacetime years."

A consensus expressed in the literature and a definite point of agreement among lighting men over the country was expressed by Higgins (16) when he said that the first step and responsibility to be taken in school lighting was the elimination and replacement of the one and two foot-candle installations.

Fluorescent vs. Incandescent Lights

The war brought a shortage of "critical materials" and prevented further "promotion and exploitation of the fluorescent lamp." With emphasis on the idea of past "exploitation," Wright (39) made a plea for intelligent and honest merchandising of this new light source in the postwar period. He predicted that fluorescent lighting will take its proper place and standing among available light sources but that it will not be the "only" source. The choice between fluorescent and incandescent will be dictated by comparative cost of equipment, intensities desired, cost of electrical power, and maintenance factors. Wright also stated that the bare lamp unit was already believed to be undesirable in any important location and predicted that future fluorescent fixture design will be toward greater shielding of lamps and lower surface brightness.

High maintenance costs (20) have been cited as the greatest disadvantage of fluorescent industrial installations. Starter, lamp, and ballast failures may cause a reversal of public demand (39). Much reliable information is available on the strengths and weaknesses of the fluorescent lamp and fixture. One of these sources of information (11) gave a comprehensive story on the operation and complexities of a fluorescent lighting system.

A consensus based on operational history indicated that for lighting installations of equal quality, incandescent systems still were preferred because of the high first cost of acceptable fluorescent fixtures; rapid changes in the design and efficiency of these fixtures and their auxiliary devices; and high maintenance costs of fluorescent systems.

Brown (2) stated in his comparison of fluorescent and incandescent systems that, "When the initial price of low brightness fluorescent fixtures becomes lower, they may well be the logical choice." He pointed out that

the naked fluorescent lamp has several times the brightness considered acceptable for good school lighting practice. Some fluorescent installations considered as model in 1941 (22) do not meet the brightness standards now recommended. Winkler (37), in a convincing effort to place fluorescent lighting on a sound economic basis, presented a well-illustrated article on fluorescent fixture design. His conclusions and recommendations were based on "three years of continued, extensive (tho at times hysterical) use of fluorescent lighting."

An intelligent choice of lighting systems cannot be made from promotional literature. Greenberg (12) gave a good idea of the complexities of factors and the technicalities involved in making a choice between lighting systems. Kilpatrick (21) compiled check charts for small or large installations. He made possible an analysis of the factors involved in the selection of equipment and service and operating costs of different lighting systems.

Maintenance of Equipment

The war brought about a great interest in making things last longer. The slogan "Make It Last," as applied to school lighting, meant greater care of lighting equipment, and much has been written on this subject. The consensus on this matter was well summarized and diagrammed by Heitzman and Knapp (15). Their graphic story was presented to prove that "maintenance pays dividends in light." They expanded the concept of making irreplaceable equipment last longer and established the economic value of proper maintenance as an all-time basic factor in its own right. Further evidence on the big dividends paid on lighting maintenance, based on operational history, was presented by Bursch and others (5).

General Conclusions

1. Brightness, brightness contrast, and brightness ratios finally have become generally recognized as the prime factors in adequate illumination.
2. The accent on brightness ratios has resulted in the recognition of the need for lighter colored chalkboards, furniture, woodwork, floors, and equipment in schoolrooms.
3. Properly controlled bilateral and clearstory lighting systems are making possible new classroom designs.
4. Daylight control by orientation, incorporating roof-overhangs, or light louvers constructed as permanent fixtures in the building design is favored over manually operated blinds and shades.
5. The foot-candle as a factor in illumination now is considered a part of the larger factor of brightness.
6. A fifteen foot-candle level is becoming established as the minimum desirable light intensity for classrooms. The trend is toward higher levels but the first big job is the elimination and replacement of lighting installations providing three or less foot-candles.
7. Fluorescence is becoming one of the major light sources and as such should be installed according to the specifications of a qualified illuminating engineer. Naked fluorescent lamps are undesirable for lighting any space used for critical seeing-tasks. First costs and maintenance problems are the two main factors retarding the installation of fluorescent lighting systems in schools.
8. Luckiesh (25) is the best single source of information now available for those wishing a comprehensive background in the field of light as related to vision and seeing.

Needed Research

1. To develop and make available in quantities an instrument by which brightness can be measured objectively and simply.
2. To establish scientifically defensible brightness standards for comfort and visibility.
3. To establish technics for the proper installation of fluorescent lighting systems and to simplify their maintenance problems.

Bibliography

1. BROOM, MYBERT E., and OTHERS. *Improving the Classroom Environment—A Manual for Teachers.* Bulletin of the El Paso Public Schools. El Paso, Texas: the Board of Education, 1943.
2. BROWN, LELAND H. "Planning Schools With A View to High-Level Daylight Illumination in Every Classroom." *American School and University.* New York: American School Publishing Corp., 1942. p. 57-61.
3. BROWNLEE, LESTRE H. "A Threat to Healthy Eyesight." *Hygeia* 20: 77-79; January 1942.
4. BURSCH, CHARLES W. "The Planning of Classrooms for Postwar School Buildings." *American School Board Journal* 108: 15-18; January 1944.
5. CALIFORNIA STATE DEPARTMENT OF EDUCATION, DIVISION OF SCHOOLHOUSE PLANNING. *Recommended Practices for Lighting California Schools.* Sacramento, Calif.: the Department, 1943. 19 p. (Mimeo.)
6. CAUDILL, WILLIAM W. *Space for Teaching—An Approach to the Design of Elementary Schools for Texas.* Bulletin of the Agricultural and Mechanical College of Texas, Vol. 12, No. 9. College Station, Texas: the College, August 1941.
7. DALLE VALLE, JOSEPH M. "Graphic Estimating of Daylight." *Architectural Record* 95: 83-84, May 1944.
8. DATES, HENRY B. "The Illuminating Engineering Society's Contributions to Improved School Lighting." *Illuminating Engineering* 36: 49-60; January 1941.
9. ENGELHARDT, NICKOLAUS L., and SCHOOL PLANNING ASSOCIATES. *Portfolio A—Elementary School Classrooms.* New York: Teachers College, Columbia University. 96 p.
10. FOWLER, EARL W., and CROUCH, CAZAMER L. "Glare and Lighting Design." *Illuminating Engineering* 36: 897-916; November 1941.
11. GENERAL ELECTRIC COMPANY. *Fluorescent Mazda Lamps.* Booklet B. Nela Park Engineering Department. Cleveland, Ohio: the Company, March 1941.
12. GREENBERG, BERNARD F. "Cost Analysis of Fluorescent vs. Incandescent Lighting Installations." *Illuminating Engineering* 37: 165-70; March 1942.
13. HARRISON, WARD, and LUCKIESH, MATTHEW. "Comfortable Lighting." *Illuminating Engineering* 36: 1109-28; December 1941.
14. HASKELL, DOUGLAS. "16 Ways of Daylighting Classrooms." *Architectural Record* 95: 75-83; May 1944.
15. HEITZMAN, H. R., and KNAPP, R. LOGAN. "Elements of Lighting Maintenance." *Illuminating Engineering* 38: 391-94; July 1943.
16. HIGGINS, THOMAS J. "Mechanical Equipment for the School." *Architectural Record* 95: 89-90, March 1944.
17. HOLY, THOMAS C. "Location, Construction and Equipment of Schoolhouses for Health." *American School Board Journal* 104: 19-20; January 1942.
18. HYNDS, HAROLD D., and OTHERS.. *Paint Colors.* Bureau of Plant Operation and Maintenance, New York: New York City Board of Education, 1944. 18 p. (8 unnumbered samples.)
19. ICKES, LYNN S. "Color Change with Lighting." *Nations School* 31: 36-37; April 1943.
20. KAHLER, WILLIAM H. "Make Lighting Fit War Workers' Needs." *Factory Management and Maintenance* 100: 116-18; December 1942.
21. KILPATRICK, JOHN L. "An Economic Evaluation of Lighting Systems." *Illuminating Engineering* 38: 493-98; November 1943.
22. LOUNSBERY, E. L. "The Use of Fluorescent Lighting in School Buildings." *American School and University.* New York: American School Publishing Corp., 1942. p. 414-18.

23. LUCKIESH, MATTHEW. "Brightness Engineering." *Illuminating Engineering* 39: 75-92; February 1944.
24. LUCKIESH, MATTHEW. "Lighting for Easy Seeing." *Architectural Record* 93: 54-59; May 1943.
25. LUCKIESH, MATTHEW. *Light, Vision and Seeing.* New York City: D. Van Nostrand Co., 1944. 323 p.
26. LUDVIGH, E. "Effect of Reduced Contrast on Visual Acuity as Measured with Snellen Test Letters." *Archives of Ophthalmology* 25: 469-74; 1941.
27. MOON, PARRY. "Wall Materials and Lighting." *Journal of the Optical Society of America* 31: 723-29; December 1941.
28. NICHOLS, JOHN E. "On Planning the Postwar School." *Architectural Record* 93: 63-66; March 1943.
29. PERKINS, LAWRENCE B. "New vs. Old Building Standards." *American School and University.* New York: American School Publishing Corp., 1944. p. 25-30.
30. PERKINS, LAWRENCE B. "Rugen School, Glenview, Ill." *New Pencil Points* 24: 35-43; September 1943.
31. RAHN, ARTHUR O. "Teacher Management of Classroom Lighting." *Clearing House* 16: 550-52; May 1942.
32. REID, JOHN L. "The School Plant Re-examined." *New Pencil Points* 24: 44-68; September 1943.
33. TAYLOR, A. HADLEY. "Brightness and Brightness Meters." *Illuminating Engineering* 37: 19-30; January 1942.
34. THOMPSON, CHARLES E. "Ophthalmic Scoliosis." *The Research Quarterly* 13: 68-75; March 1942.
35. WILLIAMS, SAMUEL B. "What's Ahead for Lighting." *Illuminating Engineering* 38: 415-20; September 1943.
36. WILSON, F. I. "Through the Ophthalmologist's Eyes." *American School Board Journal* 108: 28-30; May 1944.
37. WINKLER, FREDERIC C. "Fundamental Facts of Fluorescent Fixture Design." *Illuminating Engineering* 37: 229-47; April 1942.
38. WRIGHT, HENRY L. "Intelligent Planning of Classroom Lighting." *American School and University.* New York: American School Publishing Corp., 1943. p. 184-87.
39. WRIGHT, HOWARD L. "Tomorrows Lighting." *Illuminating Engineering* 39: 306-10; May 1944.

CHAPTER IX

Heating and Ventilating the School Building

PAUL W. SEAGERS

THERE HAS BEEN little recent research in school heating. The low temperature panel-sealed heating system is considered desirable in theory with scanty evidence of its being practical at this time.

Ventilation

Likewise there has been very little recent research on the over-all ventilation of school buildings. However, intensive studies have been made on some phases of ventilation. The quantity theory (diluting the air in the room with 30 cubic feet of fresh air per minute, thus requiring mechanical ventilation) was based upon experiments by Pettenkofer in 1863. It has now been generally discarded in favor of the comfort and health theory which, according to C. E. A. Winslow, embraces atmospheric quality and thermal balance of air.

Atmospheric Quality

The 1943 *Heating, Ventilating and Air Conditioning Guide* (3) listed the normal concentration of dust and the present accepted standards for toxicity of gases and vapors in the air. Yaglou and Wilson (1) found that "passing air through commercial filters reduces substantially its bacterial content." This method, however, did not affect the bacteria introduced into the room by means other than fresh air except as recirculation was used. Wells (10) found in his experiments with ultraviolet irradiation at the Swarthmore and Germantown schools that "epidemic spread of childhood contagion in irradiated classrooms during winter months appears to have been checked, while measles, mumps, and chicken pox prevailed during the same period in unirradiated classrooms in these schools and nearby primary schools." The continuance of Wells's studies and those now undertaken at Cato-Meridian, Port Byron, and Mexico by the New York State Departments of Health and Education (9) were designed to find out if irradiation were more effective than dilution of air in providing freedom from air-borne infection. Masterman (1) has been using the aerosol sodium hypochlorite while Robertson (1) has been studying the effects of the aerosol propylene glycol upon air-borne diseases. Studies made by Yaglou and Wilson (1), as well as those made by Winslow and others (11), showed that the use of ozone was undesirable. Winslow (11) also concluded that ionizing the air in a room contributed nothing healthful.

Thermal Balance

The American Society of Heating and Ventilating Engineers (3) determined that during a heating season the room air velocities should not be in

excess of 25 to 30 feet per minute and during a cooling season not more than 40 or 50 feet per minute. Similar conclusions were drawn by Winslow (11). Jordan (5) determined the diffusion of air at various temperatures and introductory velocities. The *Heating, Ventilating and Air Conditioning Guide* (3) included an effective temperature chart designating a comfort zone for the cooling season and another comfort zone for the heating season. Winslow (11) designated an operative temperature because humidity, which is considered in effective temperature, cannot be controlled in extreme temperatures. The American Public Health Association (2) indicated that the foot level in a room should be as warm as the head level. The work of Houghten and McDermott (4) on body radiation to cold surfaces, altho one of the older studies, should be considered here because of its influence on the proposed new type panel heating. Yaglou, Riley, and Coggins (12) found that the odors given off by pupils were influenced greatly by their socio-economic status; thus the amount of fresh air necessary for the removal of these odors was determined for the several socio-economic levels.

McGrath (6) indicated that if the ventilation and heating of a building were zoned according to exposures rather than sections and wings, the troublesome effects of infiltration could not only be overcome but perhaps utilized to a great degree. Nelson and others (7, 8) studied the position, types, and performance of ducts and stack heads.

Once educational research has determined the conditions necessary for comfort and good health at school, engineering research will provide the type of equipment to obtain those conditions. The question of window ventilation versus mechanical ventilation will probably be determined in terms of specific rooms and buildings rather than by a general rule, as orientation, wind velocities, and types of construction and use vary so greatly.

Bibliography

1. AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE. *Aerobiology Number 17.* Smithsonian Institute Building, Washington, D. C.: the Association, 1942. 289 p.
2. AMERICAN PUBLIC HEALTH ASSOCIATION. "Ventilation and Atmospheric Pollution." *Supplement to American Journal of Public Health,* Vol. 31, No. 3. New York: the Association, March 1941. p. 115-34.
3. AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS. *Heating, Ventilating and Air Conditioning Guide.* New York: the Society, 1943. p. 558.
4. HOUGHTEN, F. C., and MCDERMOTT, PAUL. "Cold Walls and Their Relation to the Feeling of Warmth." *Transactions of the American Society of Heating and Ventilating Engineers.* No. 946. New York: the Society, January 1933. p. 83-94.
5. JORDAN, R. C. "Air Diffusion in Ventilation Systems." *Heating, Piping and Air Conditioning,* Vol. 7, No. 5. Chicago: Keeney Publishing Co., May 1935. 5 p.
6. MCGRATH D. E. "Heating and Ventilating the Postwar School." *American School Board Journal.* Milwaukee, Wis.; Bruce Publishing Co., January 1943. p. 20.
7. NELSON, D. W.; KRAUS, D. H.; and TUTHILL, A. F. "The Performance of Stack Heads." *Heating, Piping and Air Conditioning.* New York: Journal Section of the American Society of Heating and Ventilating Engineers, January 1940.

8. NELSON, D. W., and SMEDBERG, G. E. "The Performance of Side Outlets on Horizontal Ducts." *Heating, Piping and Air Conditioning.* New York: Keeney Publishing Co., November 1942. p. 686-93.
9. WALL STREET JOURNAL. "Experiment Planned." *Wall Street Journal.* New York: Dow-Jones and Co., Inc., June 5, 1944.
10. WELLS, W. F. "Air Disinfection in Day Schools." *American Journal of Public Health.* Albany, New York: American Public Health Association, December 1943. p. 1436-43.
11. WINSLOW, C. E. A., and OTHERS. "Recent Advances in Physiological Knowledge and Their Bearing on Ventilation Practice." *Transactions of the American Society of Heating and Ventilating Engineers,* Vol. 45. New York: the Society, 1939.
12. YAGLOU, C. P.; RILEY, E. C.; and COGGINS, D. J. "Ventilation Requirements." *Heating, Piping and Air Conditioning.* Chicago, Ill.: Keeney Publishing Co., January 1936. p. 65-76.

CHAPTER X

Trend in Materials and Design

REGINALD E. MARSH

THERE HAS BEEN a big improvement in materials and equipment during the past three years due to their need for war purposes. On the other hand, there has been a tendency to overemphasize the development of new materials for postwar construction, particularly by manufacturers in their efforts to keep their names and products before the eyes of the public. This has been unfortunate because it has created in the minds of those who would like to plan for postwar construction a fear that any plans and specifications prepared now would be obsolete by the time construction can be started, because of the wonderful new products prophesied for the future. Those in a position to know have recently made an effort to discount such views and to bring the true facts to the attention of the public.

Wartime restrictions have limited the use of construction materials for those items determined as nonessential. The vast majority of projects constructed during the past three years have consequently been of a temporary character, and little can be gained from a review of these buildings. It is interesting to note, however, the opinions of various writers who are in a position to visualize future construction methods and materials toward which there appears to be a definite trend.

It would appear that Nichols (24) covered the subject about as comprehensively as any other writer. He concluded that there will be few, if any, new materials which will affect the designs of our buildings and no new construction methods which were not used before the war. There have been refinements and developments of old materials and technics. He discussed lighting, heating and ventilating, plastics and laminated wood, particularly the resin-impregnated wood.

Childs and Smith (4) referred to plywood, plastic, and aluminum as "new materials" to be used to provide more livable, sanitary, and cheerful classrooms. Control of light by polarized glass was suggested to eliminate headaches. Development of plastic, asphalt, and rubber for more durable and more easily maintained floors; acoustic material for lessening the noise nuisance; use of wallpaper and redecoration of classrooms from year to year were also mentioned. In the mechanical branches, they expected the practical development of fluorescent lighting to provide sunlight on cloudy days; radiant heat, air conditions, and the substitution of electrical units and window ventilation to supersede the expensive central ventilating systems.

Hacker (14) claimed new materials will be evolutionary rather than revolutionary. He described a new method of treating aluminum for ornamental use which will prevent discoloration and referred to a new development in brickwork to provide leak-proof walls.

The field of plastics seems to hold the interest and fires the imagination of laymen, as well as professional men. Even at their present stage, plastics are only beginning their career. The multitude of chemical compounds yet to be discovered, investigated, and perfected is actually beyond the imagination. But, while enthusiasm is justifiable, it must be tempered with realism. Like all other structural man-made substances, plastics have limitations.

Plywood is another product which appears to have great future possibilities. The scarcity of lumber, however, may have some effect on the development and use of this material in the immediate postwar period. Nevertheless, research and experiments continue, and many new treatments are being discovered. For instance, a treatment is being perfected which will provide a triple protection against decay, termites, and fire. The use of special resins under high frequency heat treatment has opened the door to greater use of wood, both for structural and finishing purposes. Bonded metal plywood has passed thru the experimental stage. New metal alloys have been developed during the war, particularly with aluminum, which will not only permit but demand increased use of these metals for both structural and finishing materials.

There will be increased use of acoustical materials. Insulated glass, consisting of double and triple panes with dehydrated air sealed in between, and increased use of glass blocks are also developments which, along with the plastics, plywood, and metals indicate the trend not only of construction methods but design as well.

All the above mentioned materials are not new materials but are improvements of existing materials. Nothing has been developed recently which would even slightly affect the basic construction methods and materials such as concrete, brick and tile masonry, wood, and structural steel in various forms. It is obvious, therefore, that the trend in future school building construction will be toward simplification and greater use of the improved products developed as a result of war necessities.

Engelhardt (7) believed that the war would sweep away many harmful controls on the production of materials and a great number of new products would be developed. In order to regain their prewar status, building material manufacturers will be back on the market with improved materials at lower cost.

Burkett (3) warned that the architect must be given encouragement to take advantage of technological developments and not be limited to some particular style of architecture. Otherwise he will not be able to solve successfully the school building problem.

Adkins (1) cites the advantages and disadvantages of radiant heating. Palmer (26) warned against adoption of panel (radiant) heating without complete data on costs and efficiencies as compared with present accepted types of heating and particularly ventilation, which must not be forgotten. He also believed that new materials and methods of construction will follow an evolutionary process and extravagant claims regarding new products should be discounted.

Battista (2) claimed that plastics will undoubtedly become the most versatile of man's primary construction materials because they are man-made and the variety is unlimited. Consequently, there will be many applications of plastics in future school buildings. He referred to the use of so-called "penetrating heat" for plywood. O'Connor (25) discussed thoroly the various types of plastics and their uses.

Neutra (21) felt that new methods of joining the framework of finishing surfaces and of installing appliances would modify layouts and designs. Future school buildings will include illumination by day and night, apparatus for television and broadcasting, and acoustical and visual devices. Present products will find broader applicability because of their use in war industries, such as paints and coatings, plastics, new metal alloys, diatron composition, temperature insulating panels, and plywood.

There will undoubtedly be a number of improvements in electrical devices. For instance, a germicidal lamp has been developed which, it is claimed, duplicates certain characteristics of interstellar sunlight and can be used for the purpose of disinfecting the atmosphere and thereby providing the equivalent in a classroom of approximately sixty changes of air per hour. Fluorescent lighting is still in the developmental stage and its suitability for classroom lighting remains to be demonstrated altho the cold cathode type holds out possibilities of an ultimate solution.

Design

The past three years have been practically destitute of new schoolhouse construction due to restrictions imposed by the need of construction materials for war purposes. Consequently, there have been comparatively few recently built schools publicized, other than those constructed to meet the demands of defense and war housing, and the majority of these have been of a temporary nature. However, the impact of the war on the educational needs of the people will have a vital influence on the design, planning, and construction of schools in the immediate postwar period.

Postwar conditions will require more school building for less money. This has been true with wartime schools which were built to provide for temporary accommodations. Engelhardt (9) noted that safety and sanitation have been stressed in the past, together with concentration of school building spaces and designing of architectural monuments, and prophesied that in the future the purpose to which the school is to be put will be the important thing. Mechanistic characteristics will be out, and instead, the social significance of spaces in the school building will be the chief concern.

The consensus is that the trend is toward better schoolhouse design. The question immediately arises "What is a good design and how can it be made better?" Beauty to some extent is a matter of personal opinion and the subject therefore is controversial. In the past history of our country there have been many periods of architectural styles which have reflected the opinion of architect and layman at that particular time. These styles were adaptable to the types of buildings which were erected then, including

schoolhouses. A school building is acknowledged to be a difficult problem from the design standpoint because of the repetitious nature of the units to be incorporated, as well as state requirements and regulations affecting the physical well-being of the child. As schoolhouses became larger and more complex and state regulations more rigid, the exterior design required new architectural treatment, and it is due to these conditions that school buildings are now being streamlined and otherwise depart from a particular period of architectural style. Burkett (3) stated that architecture thruout world history has reflected the life and environment of the nation. In this country our leadership in a great industrial epoch is now beginning to be reflected. The day of individual craftsmanship is past because most materials are machine made. Engelhardt Jr. (10) claimed that school buildings are no longer used to sell communities. Therefore, monumentalism is of no concern to the lay citizen and excessive ornamentation is not wanted. School buildings must be attractive places in which to work as well as attractive to the eye.

Holmes and Shigley (16) foresee school buildings that will be different after the war. The trend is toward simplified design—modern not modernistic—and this trend has demonstrated that beauty in architecture can be achieved thru simplicity of line, plain surfaces, and attractive colors rather than thru ornamentation. In the opinion of Mock and Mock (20), the fundamental characteristic of modern architecture is its treatment of space as flowing and continuous from one room to another and from inside to outside. That is one reason for the use of continuous glass surfaces. The modern school is beautiful because of the bold articulation of its parts instead of being compressed into one massive block, and each element of the building expresses its function thru its form. This allows its adaptation to an irregular site.

According to Lescaze (17) educational programs have progressed far in advance of the planning and designing of school buildings. Consequently we may look forward to improvement. School buildings should be functional as well as beautiful in design. The plan must be free and easy to follow, natural, and economical. Façades should express the plan simply and honestly. There should be a logical use of materials expressive of the plan, native to the locale, and properly arranged. Thompson (31) stated that there are many communities with traditional American architecture which are awake to the need of modern progressive schools, and the architect has the problem of designing a thoroly modern building in such communities. He believes this can be accomplished in various ways so as to effect the appearance of a natural setting and that a homelike character creates a community center which attracts people to it. On the other hand, Schmidt (29) raised the question whether the esthetic is a function of education and whether beauty is an element either desirable or necessary in our planning. Does a beautiful environment further the educational process?

Malmfeldt (18) believed that a fine period of modern architecture will

be developed to express a good plan honestly. Such a plan can be symmetrical or unsymmetrical. Any forcing of a plan to express a particular period style should not be considered. Sibley (30) contended that a school building will steadfastly resist any threat to its expression of beauty altho monumental architecture is not necessary to obtain dignity and beauty without and within. The so-called modern and traditional styles of architecture can be merged into a pleasing expression. Hacker (13) discussed relative costs of the modern and traditional styles of architecture and pointed out that supposed economies are often offset by increased costs not readily apparent.

Construction

According to Power (27) schoolhouses during the war were planned for temporary use. However, some may be in use for many years as these units are quite superior to the portable units used in the past. They have more glass area and are larger. The construction is such that in some cases the best of these temporary structures may be sufficiently permanent to meet all needs and will enable boards of education to make frequent replacements at low costs. They also have the flexibility required for making alterations and additions to meet changes in school needs. In certain locations any other type may be considered too expensive and wasteful from the long term of view. Reid (28) claimed that building economy will require the use of prefabrication for postwar planning of schools. Prefabricated units and products will command wider acceptance because of their quality. This same idea will extend to furniture, equipment, and tools of teaching. Prefabrication will permit fluidity in a building capable of meeting the needs of constantly changing community and regional life. On the other hand, Crawford and Dailard (5) claimed that wartime experimentation with prefabricated demountable school buildings has thus far proved unsatisfactory and has not been of low cost. To be economical, prefabrication requires thousands of identical units and assumes a standardization and rigidness of educational program that cannot exist. Donovan (6) also believed the trend to be toward economy and away from monumental and ideal architecture. Where permitted he recommended frame construction and claimed many advantages for one-story buildings. On the other hand, Hacker (15) insisted that quality will still be demanded to reduce maintenance costs and obsolescence. He called attention to the development of plastics and noncombustible materials, and the trend toward color consciousness.

Architects

Friswold (12) stated that architects must change their viewpoint and philosophy if new developments in design are to be achieved. The same thought is expressed by Reid (28), who claimed that the architect is the key man for design and construction, and he is responsible for resolving the program needs into a well-balanced and well-integrated design. The use

of costly materials and mechanical equipment which sacrifices needed space for educational facilities is a failure of the architect's professional services.

Building Codes and State Regulations

Reid (28) believed that building codes and design standards should be revised to be based on performance standards, because fixed standards of design and layout can do more harm than good. They may be used as devices to avoid creative and independent thinking and are subject to immediate obsolescence. For instance, a fixed area for a classroom is inadequate if it fails to meet the needs of a specific program. The California system of requirements is largely responsible for the development of modern school plant design in that state. Engelhardt (8) stated that regulations have tended to freeze building concepts into fixed molds, but that such standards have been of inestimable value in moving away from stupidity and indifference. Nichols (23) believes that codes should be informative as well as regulatory.

Flexibility

Misner (19) believed that experimental activity programs suggest specialized rooms for preprimary, primary, and post-primary units. The flexible organization in an elementary school must be considered in planning the building. Reid (28) stated that anticipation of change is of the greatest importance and can do much toward postponing eventual obsolescence. The type and use will determine the manner of achieving flexibility. An entire classroom wing may be considered as loft space with interior partitions which can be rearranged. Nichols (22) doubted if movable partitions were the solution because of other conditions such as heating, ventilating, plumbing, and lighting. Friswold (12) referred to multiple use of rooms and equipment and ready extension of the physical plant. Lescaze (17) quoted C. G. Stillman, county architect of West Sussex, England, on his recommendations for providing flexibility of plan of the building as a whole. Evans (11) recommended that spaces should be left free and as unobstructive as possible to provide for both individual freedom and group activity. Since a modern classroom may be in turn a laboratory, a workroom, and a little theater, flexibility is of prime importance. Childs and Smith (4) prophesied that altho built substantially for minimum maintenance, school buildings will be more flexible with demountable interior partitions and standardized units of equipment that may be moved to suit the varying teacher needs and requirements.

Bibliography

1. ADKINS, ROBERT W. "Radiant Heating." *Nation's Schools* 31: 34-35; April 1943.
2. BATTISTA, ORLANDO A. "Plastics in the School Building of the Future." *American School Board Journal* 107: 18-19; August 1943.
3. BURKETT, RHEES E. "Suburban School Building After the War." *American School and University*. New York: American School Publishing Corp., 1943. p. 17-21.

4. CHILDS AND SMITH. "Study for a Postwar Elementary School." *New Pencil Points* 24: 70-71; September 1943.
5. CRAWFORD, WILL C., and DAILARD, RALPH C. "Postwar Design." *Nation's Schools* 31: 34-38; January 1943.
6. DONOVAN, JOHN J. "Six Views on Postwar Design." *Nation's Schools* 30: 29-30; October 1942.
7. ENGELHARDT, NICKOLAUS L. "An Analysis of Planning for Postwar School Construction." *American School and University*. New York: American School Publishing Corp., 1943. p. 60-65.
8. ENGELHARDT, NICKOLAUS L. "The Impact of the War Upon School Building Planning." *American School and University*. New York: American School Publishing Corp., 1942. p. 13-20.
9. ENGELHARDT, NICKOLAUS L. "What Can School Designers Expect?" *New Pencil Points* 23: 46-54; November 1942.
10. ENGELHARDT, NICKOLAUS L., JR. "Trends in Schoolhousing Design." *American School Board Journal* 104: 27-28; January 1942.
11. EVANS, FRANK O. "Building for the Small Elementary School." *American School Board Journal* 104: 15-18, 76; January 1942.
12. FRISWOLD, INGOLF O. "On Planning the Postwar School." Part II. *Architectural Record* 93: 63-66; March 1943.
13. HACKER, RALPH E. "Does Modern Design Cost Less?" *Nation's Schools* 32: 34-36; July 1943.
14. HACKER, RALPH E. "New Materials for Postwar Educational Buildings." *American School and University*. New York: American School Publishing Corp., 1944. p. 60-65.
15. HACKER, RALPH E. "Six Views on Postwar Design." *Nation's Schools* 30: 30; October 1942.
16. HOLMES, WARREN S., and SHIGLEY, ARTHUR R. "A School Building Planned Around the Educational Program." *American School and University*. New York: American School Publishing Corp., 1943. p. 43-46.
17. LESCAZE, WILLIAM. "Types of Schools to Serve Tomorrow's Need." *American School and University*. New York: American School Publishing Corp., 1943. p. 33-36.
18. MALMFELDT, CARL S. "Six Views on Postwar Design." *Nation's Schools* 30: 30-31; October 1942.
19. MISNER, PAUL J. "Planning for New Teaching Techniques." *Architectural Record* 93: 32-33; March 1944.
20. MOCK, ELIZABETH B., and MOCK, RUDOLF. "Schools Are for Children." *American School and University*. New York: American School Publishing Corp., 1943. p. 37-42.
21. NEUTRA, RICHARD J. "Six Views on Postwar Design." *Nation's Schools* 30: 31-32; October 1942.
22. NICHOLS, JOHN E. "On Planning the Postwar School." Part I. *Architectural Record* 93: 63-66; March 1943.
23. NICHOLS, JOHN E. "School Building Codes." *American School and University*. New York: American School Publishing Corp., 1944. p. 31-35.
24. NICHOLS, JOHN E. "The Truth About Postwar Materials." *Nation's Schools* 33: 37-38; April 1944.
25. O'CONNOR, JANE. "The Plastics Are Coming." *Nation's Schools* 30: 31-34; November 1942.
26. PALMER, GERALD L. "School Building Materials: Their Availability for Present and Postwar Construction." *American School Board Journal* 108: 35-36, 60; June 1944.
27. POWER, LEONARD. "Lessons From the Lanham Act for School Plant Design." *American School and University*. New York: American School Publishing Corp., 1944. p. 46.
28. REID, JOHN L. "The School Plant Re-Examined." *New Pencil Points* 24: 50-59; September 1943.
29. SCHMIDT, HANS W. "The Case of 'Functional' Planning." *American School Board Journal* 104: 48-49; January 1942.
30. SIBLEY, ERNEST F. "Six Views on Postwar Design." *Nation's Schools* 30: 32; October 1942.
31. THOMPSON, GEORGE R. "Fitting the Modern School into the American Village." *School Management* 2: 132-33; January 1942.

CHAPTER XI

School Plant Operation

H. H. LINN and CLEVE O. WESTBY

THE LITERATURE on school plant operation which has been published since June 30, 1941, is characterized more by the reaction toward the effects of the wartime economy than by any other single factor. This has been evidenced by the many references to shortages in materials, equipment, and man-power. While much of the literature was in the nature of advice and opinion as to how to meet the difficulties of maintaining school plants at a high level of efficiency, many of the articles dealt with specific instances where the crises were successfully met. It may be stated that very little can properly be classed as representative of research. Two general books for custodians were published. Brainard (11) presented the subject briefly but practicably, pointing out how custodians should do their job. Viles (90) covered the field more completely.

Personnel

Selection—Difficulties in attracting qualified men or women to custodial positions have been occasioned by the competition offered by defense plants and other employers, who have been able to pay higher wages than the schools. As a result, standards and qualifications for new employees have been greatly reduced or disregarded. Suggestions for meeting the situation were presented by Akerly (1), Cunliff (22), DeVries (25), Linn (52), *Nation's Schools* (61), and the U. S. Department of Agriculture (89). More women were being employed, and suggestions for extending the use of women as well as evaluation of their service in a custodial capacity were given by Flint (34) and Gibbs (37). Other advocates of more women employees were Linn (52), *Nation's Schools* (61), and *School Management* (79). Brainard (11) and Viles (90) gave in detail their standards to be used in selecting building employees. Sullivan (84) described Boston's civil service plan for schools, which he recommended be extended to custodians. Gillis (39), in a study of custodians in Connecticut, stated that only 57.8 percent were selected by the superintendents. Behn (9) presented an examination developed at the University of Minnesota to be used in selecting building employees. Hynds (44), Kaiser (47), McGrath (53), and *School Management* (79) called attention to the need for more care and higher standards in the selection of new building personnel. Linn (52) stated that many schools were overstaffed because of poor standards of selection, sympathy for aged and incapacitated individuals, and political patronage.

Training—Increased attention was paid to training programs for custodians. Gillis (39) reported that the University of Connecticut provided a free short course to any custodian in the state, but only 12 percent of

the school systems in the state took advantage of this opportunity in 1942. A list of the more noted custodial schools in the United States was given by Linn (52). The growing complexity of the custodian's job was given by McGrath (53) and Olson (70) to show the need for increased training of building employees. Taylor (85) stated that one means of overcoming the serious situation in personnel because of the war was a better program of in-service training. Dolan (26) described the training program at Detroit, and Stoy (83), the in-service program at Denver. A description of the custodian course offered at Kansas State Teachers College was made by Winkel (93). Brainard (11) and Viles (90) stressed the importance of training school custodians, prescribed methods, and gave a list of schools where such training has been held.

Work schedule—That the importance of work schedules is not yet fully appreciated was indicated in Gillis's study (39) which pointed out that 65 percent of the school systems in Connecticut had no work schedules whatsoever. As a means of meeting the building service crisis in wartime, Linn (52) suggested better scheduling with staggered shifts and night cleaning. Brainard (11) presented a model schedule that might be used with slight modification in many schools. Schedules for summer vacation repair and renovating work were suggested by *Nation's Schools* (63) and Robinson (77). The *Catholic School Journal* (18), Cunliff (22), Gillis (39), and Taylor (85) emphasized the need for better planned work schedules.

Salaries—The relatively low salaries paid custodians were given as a principal reason for the dearth of good school building personnel. Olson (70) stated that generally custodians' salaries were not compatible with the responsibility that they must assume. The *Nation's Schools* (61) maintained that the 10 to 15 percent increases generally given building employees during the war period were not enough to offset the effect of competition for workers in industry. Leonard (51) presented plans adopted by a number of cities for stabilized salaries for school employees. The *American School Board Journal* (3) described the schedule of salaries and annual increments adopted by the Canton, Ohio, schools. The same periodical (4) also published the salary schedule for noninstructional employees in use in St. Louis. The American Association of School Administrators (2) and the National Education Association (66, 67, 68) issued bulletins listing the salaries of operation and maintenance employees in the larger cities of the United States. Meisner (55) described a plan whereby school employees were given a bonus of 10 percent to offset the increased cost of living and higher income taxes. The salary schedule of the University of California for nonacademic employees was outlined by Kaiser (47), while Lemmel (50) set forth the plan employed by the Highland Park, Michigan, schools. Cunliff (22), DeVries (25), Linn (52), and Thompson (88) agreed that salaries are too low and that the morale of building employees depends upon their being paid a more adequate wage.

Working conditions—The status of the custodian as a member of the school staff would seem to be in for considerable improvement. The matter of hours, of work, tenure, retirement provisions, sick leave, insurance, and promotion all came in for discussion. Akerly (1), DeVries (25), Grieder (40), and Viles (90) were of the opinion that custodians are entitled to the same privileges of tenure as those accorded to teachers. Linn (52) asserted that custodians are entitled to the same rights as other workers. Clarke (20) urged schoolboards to declare their intentions as far as complying with the Burke-Wadsworth Act in the matter of restoring jobs to draftees when they are discharged from the armed services. Fuller (35) presented an analysis of the status of school employees so far as they are protected under the workmen's compensation laws of the several states. He called attention to the difficulty in interpreting just who is included under such laws and to their lack of uniformity. Gibbs (37) stated that women should not be expected to do work involving heavy lifting and that some provision should be made for rest rooms for them. While retirement provisions and methods of handling retirement funds for nonteaching employees were discussed by Baish (7), Clifford (21), Mohlman (56), and the National Education Association (69), Gillis (39) found that only four out of 169 school systems studied in Connecticut included the building employees in their retirement systems. Gilbert (38) presented the case for social security benefits being extended to all school employees and Mohlman (56) discussed the possibilities of retirement for nonteaching employees under the existing local, state, and federal setups. Hope (42), in his doctoral thesis, offered a detailed plan for the treatment of nonteaching employees that is superior to anything in the field.

Supervision—A comprehensive check list with instructions for scoring service was presented by Viles (90). Winkel (93) described the functions of the traveling serviceman in checking and helping custodians within a large school system.

Dress—That neatness and pride in appearance are indicative of a man's regard for the quality of his work was the opinion expressed by Brainard (11), Thompson (87), and Viles (90). While they were generally agreed as to what the uniform should include, Viles (90) would add a belt with loops for frequently needed tools and a cap to match the uniform. Each of the men gave several reasons why the custodian and the school both would gain by attention on his part to his appearance. Gibbs (37) recommended that women employees also should be provided with a uniform.

Housekeeping

While most articles on the topic dealt with the methods of housekeeping, many others described tools which should speed the custodian in his labors and help him to do a better job. In their books, Brainard (11) and Viles (90) emphasized the necessity for good tools and gave considerable attention to their selection, use, and care. Flikheid (32), in a series of

articles, described brushes as to use and construction, paying particular attention to the different kinds of fibers used. Du Frain (27) and George (36) stated that providing the custodian with good tools not only helped him do a better job but also increased his morale. Davenport (23) reported that the use of vacuum cleaners at Michigan State College had resulted in a saving of 40 percent in sweeping costs in spite of an increase of 67 percent in floor area. Tests there indicated that not only did it take less time to clean a room with a vacuum cleaner, but also a far better job was done. Bowers (10) gave the specifications for a janitor's cart which has spaces for all supplies and tools, containers for sweepings and waste-paper, and which may readily be pushed from room to room.

The *American School Board Journal* (5) stressed the importance of good housekeeping and stated that old buildings without modern features are often more desirable to work in than new ones because of better housekeeping, and that modern gadgets must not be substitutes for good care. Brainard (11), the Seattle schools in their *Custodian's Manual* (80), Viles (90), and Williams (92) treated the subject of housekeeping quite fully. Wilhelms (91) believed that the custodian in his capacity as a housekeeper set a standard for the pupils and as such was an important member of the educational staff. Taylor (85) expressed the opinion that conservation of school buildings and equipment depended a great deal upon the quality of the housekeeping. Theisen and Sutherland (86) discussed housekeeping from the standpoint of its relation to the health of the pupils.

More specific articles included three in the *Catholic School Journal*, one (16) on removing ink stains from the floor, another (13) on cleaning window shades, and a third (19) on the preparation of a furniture polish. Toilet cleaning was treated by Hayford (41) and the *Catholic School Journal* (17). A comparison of common methods of window cleaning and a recommendation as to which would be most advisable in view of the man-power shortage were given by the *Nation's Schools* (65), while suggestions for preventing window breakage were contributed by Payne (73). Details of the construction of a dipping tank and a description of the process of preparing furniture for refinishing by this method as well as an analysis of the cost were set forth in articles by Horn (43) and Joyner (46).

Floor maintenance—No new building and relatively little replacement of floors, coupled with a shortage of many desirable products used in maintaining floors set the theme for most articles in this area. Brainard (11) and Viles (90) devoted a considerable portion of their respective books to the matter of floor maintenance, describing preservation, treatment of old and new floors, the different kinds of seals, waxes, tools, and cleaners. Rudie (78) and a group of experienced building maintenance men pooled their experience in caring for floors and their article must be judged a most practical one. Bailey (6) outlined the steps to be followed in changing from oiling to waxing floors. Ethington (30) listed one hundred ques-

tions on floor maintenance and described a novel method for sealing floors which he claimed to save both labor and materials and to produce a better job. The treatment of gymnasium floors and the prevention of warping was discussed by Hayford (41), while the steps to be followed in making floors and stairs safer were given attention by Brainard (11), Orchard (71), and Viles (90).

Fire Prevention and Other Safety Measures

Special emphasis was placed on the custodian as a safety engineer, pointing out the sources of accidents common to schools, things that he should do to prevent accidents, and rules that should be followed by all. The survey made by Irwin (45) of safety conditions in high-school buildings, gymnasiums, and grounds revealed the fact that much is being overlooked and that some precautions which are taken are relatively ineffective. The prevention of accidents that might be incurred in the course of the routine work of the custodians was noted by Flint (33) and Dench (24) who advocated training in the proper way to perform certain tasks as a means toward this end. The elimination of the fire hazard was quite well covered by Brainard (11) and Viles (90), both of whom also described the several kinds of fire extinguishers and set forth rules for their care. Ledbetter (49) discussed electrical wiring and equipment as potential fire hazards and stated some things which might be done as safeguards. A similar article appeared in the *Nation's Schools* (62). In a series of articles the *Catholic School Journal* (12, 14, 15) reviewed fire hazards and the maintenance of fire-fighting equipment. A check list on safety and fire prevention was offered by English (28).

Painting and Decorating

While many schools have for years had a standard color scheme for all classrooms, Orchard (71) told of the plan used in one system where the experts from a paint company made a survey and recommended certain color combinations which had been tested for illumination qualities and eye comfort. These were then presented to the principal and teachers of each building, who made the final selection. A continuous painting program has been inaugurated at Ironwood, Michigan, and according to Erickson (29) the difficulty of securing a large enough crew to repaint an entire building at one time has been overcome. Two painters were hired on a yearly basis and a schedule has been worked out to enable the painting to go on without interference with regular schoolwork. The desirability of a carefully planned cycle of painting operations was stressed by Siegle (81), while the entire subject of painting and refinishing was treated by both Brainard (11) and Viles (90).

General Maintenance

Roofs and walls—Relatively little was published in educational literature on this phase of building maintenance. Propper (75) discussed the

causes of leaking walls and their peculiarities and warned against overwaterproofing that might cause other trouble. Brainard (11) described the steps in roof and wall inspection and mentioned minor repairs the custodian should be expected to make. In another article Propper (74) gave a comprehensive and practicable list of suggestions on roof maintenance.

Mechanical equipment—As school heating, lighting, and ventilating installations become more automatic mechanically, the greater will be the need for custodians who not only understand how to operate the equipment but also to maintain it. During the war this was demonstrated because of the impossibility of replacing much of the mechanical equipment and of the shortage of experienced men who would normally service such equipment. Four excellent articles by Mosher (57, 58, 59, 60) appeared dealing with the inspection and maintenance of pumps, electrical equipment, piping, and the steam plant. In these he stressed inspection as the means for uncovering defects and precluding costly repairs and breakdowns, and pointed out the fact that the best results can be obtained only if inspection is done according to a schedule devised with respect to frequency with which certain parts are apt to become faulty, as well as the time of the school year. A good check list on motor maintenance appeared in the *Nation's Schools* (64) and one on the important items to note in maintaining heating and plumbing equipment was suggested by Radder (76). Smalley (82) presented a detailed list of points to be observed in caring for scrubbing machines.

The importance of scheduling maintenance operations was stressed by the *Nation's Schools* (64), Siegle (81), and others who presented the arguments that scheduling resulted in the job being done on time, less waste of effort, and in making it possible to have men and materials at hand when needed.

Custodian-Pupil-Teacher Relationships

An unusual number of articles appeared which urged increased cooperation between the pupils, teachers, and custodians in meeting the emergency caused by the war, and emphasizing the need for custodians and other staff members to appreciate the role of the custodian as a teacher, counselor, and public relations agent. *School Management* (79) described how the parents, teachers, and pupils worked out a plan to repaint and repair the school furniture and other equipment at Milford, Massachusetts. Hayford (41) and Park (72) told of methods whereby teachers and pupils could help to conserve school supplies and equipment as well as avoid causing needless work for the custodial staff. A check list for teachers on their success as classroom housekeepers was outlined by Laird (48), while Mason (54) described how students under teacher supervision might even paint a schoolroom. Bassett and Cooper (8) related the details of an effective plan used in a school in the Negro section of Harlem to control vandalism, which incorporated the student council, the school newspaper, the

pupils, teachers, and parents. Hynds (44), Olson (70), Wilhelms (91), and others presented excellent arguments to indicate that vandalism can be greatly mitigated, if not eliminated, thru establishing a better relationship between the custodian and the children. They also stressed the important function that the custodian had the opportunity to perform in the matter of guidance. McGrath (53) presented a good discussion of the relationship that should exist between the custodian, children, teachers, and community. In a chapter on public relations Viles (90) covered these same points quite well.

Bibliography

1. AKERLY, HAROLD E. "Personnel Policy in Wartime." *School Executive* 63: 27; October 1943.
2. AMERICAN ASSOCIATION OF SCHOOL ADMINISTRATORS. *Salaries of Employees Engaged in Operation and Maintenance of School Systems in Cities Above 30,000 in Population, 1942-43.* Washington, D. C.: the Association, 1943. 47 p.
3. AMERICAN SCHOOL BOARD JOURNAL. "New Wage Schedule for School Building Employees." *American School Board Journal* 104: 44; May 1942.
4. AMERICAN SCHOOL BOARD JOURNAL. "St. Louis Salary Schedule for Non-Instructional School Employees." *American School Board Journal* 107: 50; September 1943.
5. AMERICAN SCHOOL BOARD JOURNAL. "School Housekeeping." *American School Board Journal* 108: 50; January 1944.
6. BAILEY, WILLIAM W. "A New Floor Every Year." *School Executive* 62: 51-52; March 1943.
7. BAISH, HENRY H. "Advantages of Combining All School Employees in One Retirement Fund." *American School Board Journal* 103: 69; November 1941.
8. BASSETT, SADIE G., and COOPER, ROBERT J. "Teaching Children to Care for School Property." *National Elementary School Principal* 22: 361-67; July 1943.
9. BEHN, ROBERT C. "Development of Examinations for the Non-Academic Personnel of the University of Minnesota." *Studies in Higher Education.* Minnesota University Committee on Educational Research. Minneapolis: University of Minnesota, 1942. p. 188-91.
10. BOWERS, PAUL R. "Putting Wings on Our Janitors." *School Executive* 63: 53-54; October 1943.
11. BRAINARD, ALANSON D. *Handbook for Custodians.* Contributions to Education, No. 16. Lincoln: Teachers College, University of Nebraska, 1941. 170 p.
12. CATHOLIC SCHOOL JOURNAL. "Check Fire Extinguishers." *Catholic School Journal* 43: 308; December 1943.
13. CATHOLIC SCHOOL JOURNAL. "Cleaning Shades." *Catholic School Journal* 43: 31; January 1943.
14. CATHOLIC SCHOOL JOURNAL. "Conservation of Fire Extinguishers." *Catholic School Journal* 43: 31; January 1943.
15. CATHOLIC SCHOOL JOURNAL. "Fire Hazards." *Catholic School Journal* 43: 184; June 1943.
16. CATHOLIC SCHOOL JOURNAL. "Removing Ink Stains." *Catholic School Journal* 43: 31; January 1943.
17. CATHOLIC SCHOOL JOURNAL. "Routine Cleaning of Toilets." *Catholic School Journal* 41: 10A; October 1941.
18. CATHOLIC SCHOOL JOURNAL. "Scheduling the Janitor's Work." *Catholic School Journal* 42: 327-28; December 1942.
19. CATHOLIC SCHOOL JOURNAL. "Water Wax Soap Emulsion." *Catholic School Journal* 43: 31; January 1943.
20. CLARKE, J. G. "When Johnny Marches Home Again." *School Executive* 61: 28-29; December 1941.
21. CLIFFORD, J. M. "Advantages in Maintaining Separate Funds for Certified and Non-Certified Employees To Be Administered by One Retirement Board." *American School Board Journal* 103: 69-70; November 1941.

22. CUNLIFF, DONALD D. "Effect of War on Operation and Maintenance of School Plants." *American School Board Journal* 104: 39-40; June 1942.
23. DAVENPORT, WARD A. "Efficient Use of Vacuum Cleaning Equipment." *American School and University*. New York: American School Publishing Corp., 1942. p. 164-67.
24. DENCH, ERNEST A. "Proper Training Will Lessen the Hazards for New Yorkers." *Buildings and Building Management* 44: 23; February 1944.
25. DEVRIES, JOHN. "School Maintenance Department Personnel." *School Business Affairs* 10: 2, 7; April 1944.
26. DOLAN, HUGH P. "Detroit Schools Adopt Unique Plan for Training." *School Business Affairs* 10: 3; May 1944.
27. DU FRAIN, FRANK J. "I Didn't Know —." *School Executive* 61: 40; March 1942.
28. ENGLISH, COLIN. "A Check List of Points of Maintenance." *Nation's Schools* 29: 34-35; May 1942.
29. ERICKSON, ARTHUR E. "Ironwood's Continuous Painting Program." *American School Board Journal* 106: 47; May 1943.
30. ETHINGTON, CHARLES. "Catechism on Floor Maintenance." *School Business Affairs* 7: 3, 7; March 1942.
31. ETHINGTON, CHARLES. "The Sealing and Resurfacing of Floors the New Way." *School Business Affairs* 9: 1, 5; January 1943.
32. FLIKEID, JENS. "Janitorial Tools, Materials and Supplies for Use in School Building Maintenance." *American School Board Journal* 102: 48, June 1941; 103: 43-44, July 1941; 103: 46-47, August 1941; 103: 51, September 1941; 103: 48, 83, October 1941.
33. FLINT, LUCIUS S. "New Workers: More Accidents," *Buildings and Building Management* 43: 32-33; October 1943.
34. FLINT, LUCIUS S. "When You Hire Girls to Replace Men." *Buildings and Building Management* 43: 16-17; June 1943.
35. FULLER, EDGAR E. "Application of Workmen's Compensation Statutes to Public Education." *American School Board Journal* 104: 25-27; May 1942.
36. GEORGE, N. L. "Making the Best Use of Custodial Equipment and Supplies." *American School and University*. New York: American School Publishing Corp., 1944. p. 236-37.
37. GIBBS, ELIZABETH C. "Women in Building Service During the War." *School Management* 13: 68; November 1943.
38. GILBERT, LEE R. "Shall Federal Old-Age and Survivor Insurance Be Extended to School Employees?" *American School Board Journal* 106: 13-14, June 1943; 107: 23-24, July 1943.
39. GILLIS, WILLIAM E. "Status of the Connecticut Custodian." *American School Board Journal* 107: 17-19; July 1943.
40. GRIEDER, CALVIN. "Custodians Are Educators Too." *School Executive* 62: 28-29; August 1943.
41. HAYFORD, CHESTER F. "Savings in the Small School." *Nation's Schools* 29: 39; May 1942.
42. HOPE, EDWARD S. *Statutes Proposed for Non-Teaching Employees at Howard University*. New York: Teachers College, Columbia University, 1942. 67 p. (Doctor's thesis.)
43. HORN, ALVIN J., and SUTHERLAND, SAMUEL J. "A Program for the Repair and Maintenance of School Furniture." *American School and University*. New York: American School Publishing Corp., 1944. p. 232-33.
44. HYNDS, HAROLD D. "The Importance of School Building Service." *American School Board Journal* 107: 38-41; October 1943.
45. IRWIN, LESLIE W., and STEPHENS, ROSS. "Survey of Safety Conditions of Buildings and Grounds in Secondary Schools." *American Association for Health, Physical Education, and Recreation Research Quarterly* 12: 726-38; December 1941.
46. JOYNER, SCHUYLER C. "Details of Dipping Tank Method of Refinishing Desks." *School Business Affairs* 9: 6; September 1943.
47. KAISER, BOYNTON S. "Non-Academic University Positions." *Journal of Higher Education* 14: 365-69; October 1943.
48. LAIRD, ALEDA. "Making the School Home Attractive Through Good Housekeeping." *Midland Schools* 57: 208-209; March 1943.
49. LEDBETTER, R. E. "Electric Wiring Bears Watching." *Nation's Schools* 31: 42-43; February 1943.

50. LEMMEL, WILLIAM H. "Democratically Planned Salary Schedules for Non-Teaching Employees." *American School Board Journal* 105: 48-49; July 1942.
51. LEONARD, J. M. "Stabilized Salary Plans." National Association of Public School Business Officials. *Proceedings, 1942.* Pittsburgh: the Association, 1942. p. 171-78.
52. LINN, HENRY H. "School Plant Operation and Maintenance During the War Period." *American School Board Journal* 104: 40-42; March 1942.
53. MCGRATH, ROBERT T. "The Good School Custodian." *American School Board Journal* 102: 49-50; June 1941.
54. MASON, ELIZABETH. "Student Aid in School Maintenance." *Journal of Health and Physical Education* 14: 155-56; March 1943.
55. MEISNER, P. J. "Bonus Eases Cost of Living." *Nation's Schools* 32: 28; October 1943.
56. MOHLMAN, A. H. "Retirement Provisions for Non-Certified Personnel." *Proceedings, 1941.* National Association of Public School Business Officials. Pittsburgh: the Association, 1941. p. 147-51. Same *American School Board Journal* 103: 40-41; November 1941.
57. MOSHER, FRED D. "Electrical Maintenance in School Buildings." *American School Board Journal* 106: 41-42; May 1943.
58. MOSHER, FRED D. "Piping Maintenance." *American School Board Journal* 108: 45-46; February 1944.
59. MOSHER, FRED D. "Pump Maintenance." *American School Board Journal* 108: 44; April 1944.
60. MOSHER, FRED D. "School Steam Plant Maintenance." *American School Board Journal* 107: 42-43; August 1943.
61. NATION'S SCHOOLS. "Custodians Are Scarce." *Nation's Schools* 31: 46; February 1943.
62. NATION'S SCHOOLS. "Do's and Don't's in Wiring." *Nation's Schools* 29: 48; May 1942.
63. NATION'S SCHOOLS. "For Attention This Summer." *Nation's Schools* 33: 58-59; March 1944.
64. NATION'S SCHOOLS. "Maintain Motors on Schedule." *Nation's Schools* 32: 48-49; August 1943.
65. NATION'S SCHOOLS. "When It's Window Washing Time." *Nation's Schools* 33: 54-55; February 1944.
66. NATIONAL EDUCATION ASSOCIATION, RESEARCH DIVISION. "Salaries of City School Employees." *Research Bulletin* 21: 1-23; February 1943.
67. NATIONAL EDUCATION ASSOCIATION, RESEARCH DIVISION. "Salaries Paid to Administrative and Supervisory Officers in Cities Over 100,000 Population." *Special Salary Tabulations I-B.* Washington, D. C.: the Association, June 1943. 10 p.
68. NATIONAL EDUCATION ASSOCIATION, RESEARCH DIVISION. "Salaries Paid to Administrative and Supervisory Officers in Cities of 30,000 to 100,000 Population." *Special Salary Tabulations II-B.* Washington, D. C.: the Association, 1943. 13 p.
69. NATIONAL EDUCATION ASSOCIATION, RESEARCH DIVISION. "Statutory Analysis of Retirement Provisions for Teachers and Other School Employees." *Research Bulletin.* Washington, D. C.: the Association, 1944. 63 p.
70. OLSON, EUGENE O. "What Every Custodian Should Know." *Nation's Schools* 33: 54-55; January 1944.
71. ORCHARD, RALPH P. "Economy Through the Use of Better Methods and Materials." *Proceedings, 1942.* National Association of Public School Business Officials. Pittsburgh: the Association, 1941. p. 178-81.
72. PARK, RALPH H. "It Is Up to Teachers and Pupils." *Nation's Schools* 29: 38-39; May 1942.
73. PAYNE, JAMES L. "Spare the Windows." *Nation's Schools* 29: 47-48; May 1942.
74. PROPPER, WALTER. "Doing Right by Your Roof." *Nation's Schools* 31: 44-45; June 1943.
75. PROPPER, WALTER. "Patching Isn't Always the Answer for Leaking Walls." *Nation's Schools* 32: 45-46; July 1943.
76. RADDER, NORMAN J. "Check List for School Plumbing and Heating." *Nation's Schools* 29: 41-42; May 1942.
77. ROBINSON, RAYMOND W. "Looking Ahead to Summer Vacation Days for Renovating and Reconditioning School Properties." *School Management* 11: 274-75; June 1942.

78. RUDIE, CARL F. "Practical Pointers on Maintenance." *Buildings and Building Maintenance* 14: 22-23; August 1941.
79. SCHOOL MANAGEMENT. "How to Cope with Shortages in Non-Certificated Personnel." *School Management* 12: 303; August 1943.
80. SEATTLE BOARD OF EDUCATION. *Custodian's Manual.* Seattle, Wash.: Seattle Public Schools. 84 p.
81. SIEGLE, JOHN C. "Repairs Within and Without." *Nation's Schools* 29: 40; May 1942.
82. SMALLEY, DAVE E. "War Problems in School Floor Maintenance." *American School Board Journal* 105: 46-47; October 1942.
83. STOY, J. C. "How Denver Trains Its School Custodians." *School Management* 12: 139, 142-43, 162; February 1943.
84. SULLIVAN, ALEXANDER M. "Discussion of Personnel Problems." *Proceedings, 1941.* National Association of Public School Business Officials. Pittsburgh: the Association, 1941. p. 231-36.
85. TAYLOR, J. L. "Adjustments in School Plant Maintenance, Operation and Utilization." *American School Board Journal* 106: 33-35; January 1943.
86. THEISEN, WILLIAM W., and SUTHERLAND, SAMUEL J. "Building Health in the School Plant." *Nation's Schools* 29: 43; February 1942.
87. THOMPSON, L. O. "Emergency Janitorial Service." *American School Board Journal* 105: 52; September 1942.
88. THOMPSON, L. O. "Uniform for Janitor-Engineers." *American School Board Journal* 106: 48; May 1943.
89. U. S. DEPARTMENT OF AGRICULTURE. "School Personnel Problems." *American School Board Journal* 105: 41; October 1942.
90. VILES, NELSON E. *The Custodian at Work,* New York: University Publishing Co., 1941. 391 p.
91. WILHELMS, FRED T. "You're a Member, Mr. Janitor." *American School Board Journal* 107: 46-47; September 1943.
92. WILLIAMS, FRANK; VILES, NELSON E.; and HAMON, RAY L. *School Housekeeping.* Interstate School Building Service. Nashville, Tenn.: George Peabody College for Teachers, 1940. 16 p.
93. WINKEL, L. W., and PARKER, LAWRENCE. "The Training of School Janitor Engineers." *American School and University.* New York: American School Publishing Corp., 1944. p. 410-13.

CHAPTER XII

School Plant Insurance

NELSON E. VILES

DURING recent years REVIEW OF EDUCATIONAL RESEARCH reports on school property insurance studies have been included under various headings. In 1935 Holy (19) made a comprehensive summary of "Public School Plant Insurance," covering insurance legislation, insurance rates, loss ratios, and state and self-insurance. Since that time partial summaries have been included under various headings in several issues. In 1938 Fowlkes (13) included insurance with purchasing and store management, and Chambers (11) cited some studies under the heading "Court Decisions in the School Plant Field." In 1941 Arnold and Castetter (6) reported a few studies under the heading "Accounting, Reporting and Insurance." In 1942 Brownell and Schwarz (9) reported some insurance studies under the heading "Court Decisions in the School Plant Field." In 1944 Smith (39) listed certain insurance research studies in a chapter on "Principles of Business Administration Applied to Personnel and Other Activities." The importance of insurance in the school administrative program seems to justify at this time a comprehensive report covering the major insurance research studies published since 1935.

Need for Property Protection

Recent studies in school plant insurance have generally supported the theory that school officials are obligated to protect the district's property investments. The *Nation's Schools* (49), Babson (7), and the *American School Board Journal* (2) cited large annual school fire losses as an indication of need for such protection. Hope (22) indicated that South Carolina district valuations would not support bond issues sufficient to replace buildings lost. Roberts (37) termed the purchase of insurance good district business and the *American School Board Journal* (1) reviewed a committee report of the New York State School Boards' Association which termed school property insurance essential. Werner (51) found that court decisions uphold the authority of schoolboards to purchase insurance protection.

Fire Losses and Insurance Rates

The fire loss ratio or the relationship between premiums paid and loss indemnities received, reported in some detail in 1935, again was the subject of several studies in the 1935-1944 period. Some of the studies made during this period were limited in scope or covered loss experiences of insufficient duration to serve as a basis for determining whether insurance rates are too high or too low. However, most of the studies did show a wide margin between the premiums paid and the loss indemnities returned to the schools. Lewis (29) reported a loss ratio of 41 percent over a ten-year period in

Arkansas; Rogers (38), a 47 percent loss ratio over a five-year period in Texas; Steinhauer (40), a 36 percent loss ratio over a period of eleven years in Pennsylvania; and the *Nation's Schools* (48), a 22 percent loss ratio over an eleven-year period in one state. Werner (52), in reporting a 31 percent loss ratio in Pennsylvania, concluded that school insurance is good company business. Likewise Holy (18, 20), in reporting a loss ratio of less than 13 percent for two cities, concluded that commercial insurance rates on school buildings should be reduced. Roberts (36) found that, even tho insurance rates on school buildings had been lowered since 1930, there had been a decrease in losses and as a consequence the percentage of the premiums retained by the companies was as large as during the previous decade. The Arkansas State Department of Education (5) concluded that school fire insurance rates were excessive in that state.

In a related area *Public Management* (33) and Mallery (31) reported low loss ratios on municipal properties. However, Dauwalter (12) denied that rates on municipal buildings were excessive and the *American City* (45) reported that in seventeen out of twenty midwestern cities, rates on public property were lower than those on private property.

Administering the Local Insurance Programs

Many school officials are not familiar with basic insurance principles and practices and the local programs are often planned by resident insurance agents, who in this capacity must attempt to serve both the client and vendor. Vestal (50) found a lack of uniformity in school insurance practices. Grimm (16) concluded schoolboards should purchase, not be sold, the insurance protection needed. The *American School Board Journal* (1) stated that the school insurance program should be carefully and economically planned. *Public Management* (33) recommended complete insurance records and accurate data on coverage and property values. The use of riders to adapt standard policy forms to school needs was recommended by Grimm (16), while the *American City* (47) contended that requiring insuring companies to replace partial losses would save time for the district.

Little attention was given to the question of mutual insurance for schools. Werner (51) found some court decisions supporting and some opposing mutual contracts for schools. In a survey of Kentucky court decisions on school insurance Gruelle (17) concluded that mutual contracts in that state do not involve district credit, and that in Kentucky school districts may become members but not stockholders in mutual associations.

Following plans outlined by the writer and others in studies reported by Holy (19) in 1935 substantial savings have been made in local insurance costs thru the elimination of fire hazards, co-insurance contracts, and the use of term policies. Burkhardt (10) reported savings of 70 percent and Roberts (37) of 56 percent. Likewise, Anderson (3), Garver (15), Hunn (23), Mallery (31), and Rogers (38) reported savings from studies of local rates and the removal of rate penalties. Stone (42) recommended a new rating system based on risk and the individual district loss experience.

Evaluating Property to be Protected

Insurable values are determined by making certain allowable deductions from the present worth, which should represent present replacement cost less depreciation. Steinhauer (40) found that many schoolboards make little effort to determine property values but permit local insurance agents to estimate the coverage to be written. Grimm (16) and Joyner (27) concluded that local boards should maintain accurate property value records. Reger and Brake (34) contended that technical engineering service is necessary to establish values and to reduce costs, but Roark (35) concluded that the insuring companies should help establish values. Barker (8) recommended the use of indexes of construction costs as a means of determining values. Garver (14) termed appraisal the first step in the program and deemed local estimates ample for insurance purposes. Likewise, Nibecker (32) found local estimates acceptable. He recommended up-to-date inventories of all equipment.

Purchasing Insurance Protection

Distribution of the insurance business among local agencies and the selection of insuring companies from whom to purchase protection continued to be problems in many school districts. Jenkins (24) recommended purchasing all coverage from one company and thru one agency. Garver (15) recommended frequent checks on the stability of insuring companies and Joyner (28) used scope of business, surplus, capital, and liquidity of assets as criteria for evaluating financial stability. Purchase of insurance thru brokers was recommended by *Public Management* (33) while Suffield (43) proposed an association of local agencies each sharing in the profits even tho the coverage be written thru only one agency.

These studies showed a wide variation in the amount of coverage written. The Arkansas State Department of Education (5) found that 2121 out of 5497 buildings carried no coverage, and Lewis (29) reported one Arkansas county with no coverage. Lura (30) reported 589 fire loss cases with only about 55 percent of the loss protected. Roberts (36) reported a coverage of about 70 percent for 9296 city school buildings. Garver (15) recommended a coverage of 80 percent and Barker (8), 100 percent of the insurable value.

Self- and State Insurance

In an attempt to reduce the spread between insurance costs and returns several studies were made on the feasibility of and experiences in state or self-insurance for school property. Some of these studies were comprehensive and others were limited in scope and the length of loss experiences. In a few cases conclusions seemed to have been reached without having evaluated all of the administrative problems involved. None of the studies gave much attention to one of the major overhead costs in school insurance costs, that of local agents' commissions. However, these studies do show a

trend in thinking which should be pursued until the problem of public versus commercial insurance protection for public buildings is brought to a solution.

Holy (20, 21) reported that state insurance programs in North Dakota, South Carolina, and Wisconsin were saving money for the schools and estimated that state insurance in Ohio could save the schools at least $300,000 per year. Anderson (4), in a Georgia study, and Vestal (50), in a Texas study, concluded that state insurance would effect substantial savings in these states. In a more conservative statement Roberts (36), in reporting to the National Association of Public School Business Officials, recommended that schools study the feasibility of self- or state insurance.

Approaching the problem from another angle, Steinhauer (40) concluded that school districts in Pennsylvania could profit by forming a cooperative insurance association to operate on a loss protection basis. Gruelle (17) concluded that state underwriting costs need not exceed 5 percent and compared this with 46 percent for stock companies.

Joyner (28) and the *American City* (47) set up certain criteria such as the number of risks and ample reserves properly protected for the development of self-insurance programs. Joyner (28) did not recommend self-insurance for small districts. Stevens (41) contended that if a state provides insurance service it should accept the accompanying obligations of the protection of funds and the equalization of risk. The *American City* (44) recommended a program of rate reduction rather than the use of self-insurance.

Summary

Recent studies indicate a feeling that school insurance costs are excessive and a desire to effect a change either thru rate reduction or some form of self- or state insurance. Some of the studies indicated a felt need for more state department of education assistance in insurance studies. There seemed to be a general feeling that local district insurance administration should be improved and that local costs could be reduced.

Bibliography

1. AMERICAN SCHOOL BOARD JOURNAL. "A School-Insurance Program." *American School Board Journal* 94: 78; January 1937.
2. AMERICAN SCHOOL BOARD JOURNAL. "WPB Warns School Districts Against Fire." *American School Board Journal* 107: 64-65; October 1943.
3. ANDERSON, EINER J. "How Maine Township High School Obtained a Fifty Percent Reduction in Fire Insurance Rates." *American School Board Journal* 101: 25-26; September 1940.
4. ANDERSON, ERNEST R. "School Fire Insurance Premiums and Indemnities in Georgia." *American School Board Journal* 103: 58; August 1941.
5. ARKANSAS STATE DEPARTMENT OF EDUCATION. *Arkansas Study of Insurance Coverage Statistics on Public School Property.* Published in cooperation with the Works Progress Administration. Little Rock, Ark.: the Department, 1939. 59 p. (Mimeo.)
6. ARNOLD, WILLIAM E., and CASTETTER, W. B. "Accounting, Reporting and Insurance." *Review of Educational Research* 11: 181; April 1941.

7. BABSON, ROGER W. "Could Fire Wipe You Out?" *School Executive* 58: 16-17; August 1939.
8. BARKER, HOWARD. "Are Your Buildings Insured for All They're Worth?" *School Executive* 162: 44-45, 52, 54-55; June 1943.
9. BROWNELL, SAMUEL M., and SCHWARZ, MARGUERITE M. "Court Decisions in the School Plant Field." *Review of Educational Research* 12: 247-48; April 1942.
10. BURKHARDT, ALLEN P. "Practical Insurance Economies." *American School Board Journal* 94: 52-53; March 1937.
11. CHAMBERS, MERRITT M. "Court Decisions in the School Plant Field." *Review of Educational Research* 8: 435-36; October 1938.
12. DAUWALTER, F. S. "Seeking Economical Insurance." *American City* 56: 63-64; March 1941.
13. FOWLKES, JOHN G. "Insurance Purchasing and Stores Management." *Review of Educational Research* 8: 167-68; April 1938.
14. GARVER, HARLIE. "Appraising for Insurance." *Nation's Schools* 21: 53-55; May 1938.
15. GARVER, HARLIE. "Facts on Insurance." *Nation's Schools* 22: 55-57; September 1938.
16. GRIMM, SIMON R. "Schoolhouse Fire Insurance Practices and Procedures in Cambria County, With a Preferred Plan." Abstracted in *Abstracts of Theses, Researches Completed, and Bibliography of Publications.* Pittsburgh: University of Pittsburgh, 1938. 15: 95-104; January 1940. (Doctor's thesis.)
17. GRUELLE, ORIE P. *State Insurance on Public School Property in Kentucky.* Lexington: University of Kentucky, 1939. 136 p. (Doctor's thesis.)
18. HOLY, THOMAS C. "Is Your Fire Insurance Too Costly?" *Nation's Schools* 32: 43-44; November 1943.
19. HOLY, THOMAS C. "Public School Plant Insurance." *Review of Educational Research* 5: 370-77; October 1935.
20. HOLY, THOMAS C. "School Plant Insurance." *Encyclopedia of Educational Research.* New York: Macmillan Co., 1941. p. 1048-50.
21. HOLY THOMAS C. "State Insurance for School Buildings." *Nation's Schools* 16: 60-62; October 1935.
22. HOPE, JAMES H. *A Survey of School Buildings, Grounds and Equipment in South Carolina.* Columbia, S. C.: State Department of Education, 1937. 182 p. (Mimeo.)
23. HUNN, FRANK L. *An Insurance Program for the Atchison County Community High School.* Lawrence, Kans.: University of Kansas, May 1938. (Unpublished Master's thesis.)
24. JENKINS, H. E. "Savings on School Fire Insurance." *School Executive* 57: 32-33; September 1937.
25. JOYNER, SCHUYLER C. "Distributing Insurance to Local Agencies." *American School Board Journal* 95: 50-51; September 1937.
26. JOYNER, SCHUYLER C. "Distribution of School Fire Insurance." *American School Board Journal* 106: 27-29; February 1943.
27. JOYNER, SCHUYLER C. "Methods of Insuring School Property." *American School Board Journal* 105: 36-37; November 1942.
28. JOYNER, SCHUYLER C. "Recommended School Fire Insurance Procedure." *American School Board Journal* 106: 29-30; April 1943.
29. LEWIS, B. AUTREY. "Fire Insurance Premiums and Indemnities in Arkansas." *American School Board Journal* 91: 41, 76; October 1935.
30. LURA, CASPER P. "School Fire Insurance." *School Executive* 57: 581-82; August 1938.
31. MALLERY, EARL D. "Reducing Fire Insurance Costs." *American City* 56: 47-48; February 1941.
32. NIBECKER, A. S. JR. "Appraisal of Buildings for Insurance Purposes." *Proceedings, 1940.* Pittsburgh: the National Association of Public School Business Officials, 1940. p. 196-98.
33. PUBLIC MANAGEMENT. "How to Reduce Municipal Insurance Costs." *Public Management* 26: 8-12; January 1944.
34. REGER, CARL, and BRAKE, A. K. "Fire Insurance Engineering, How It Can Be Used to Secure Reduced Premium Costs." *American School and University.* New York: American School Publishing Corp., 1937. p. 165-68.
35. ROARK, GEORGE J. "21% More Fire Insurance at 23% Less Cost." *American City* 57: 63; March 1942.

36. ROBERTS, H. C. *An Investigation of Insurance Practices in Various Lines Covering United States Schools.* Bulletin No. 9. Pittsburgh: the Research Committee of the National Association of Public School Business Officials, 1941. 239 p.
37. ROBERTS, H. C. "Stretching the Board's Fire Insurance Dollar." *American School Board Journal* 102: 27-29; March 1941.
38. ROGERS, V. Z. "School Building Fire Insurance." *American School Board Journal* 102: 56, 95; February 1941.
39. SMITH, HARRY P. "Principles of Business Administration Applied to Personnel and Other Activities." *Review of Educational Research* 14: 188-89; April 1944.
40. STEINHAUER, MILTON H. *Fire Insurance on Public Property in Pennsylvania.* Philadelphia: University of Pennsylvania, 1939. 124 p. (Doctor's thesis.)
41. STEVENS, B. F. *Contractual and Administrative Principles in School Property Insurance.* Fargo, N. Dak.: University of North Dakota, 1935. 123 p. (Unpublished master's thesis.)
42. STONE, HAROLD A. "An Answer to a Fire Chief's Prayer." *Public Management* 18: 8-10; January 1936.
43. SUFFIELD, CHARLES L. "An Agreement for a One Client Association of Insurance Agents." *American School Board Journal* 102: 50-51; June 1941.
44. THE AMERICAN CITY. "Fire Insurance on Municipal Property." *American City* 55: 47-49; June 1940.
45. THE AMERICAN CITY. "Insurance Rates Lower on Public Buildings." *American City* 56: 7; February 1941.
46. THE AMERICAN CITY. "More Precious Than Price." *American City* 56: 7; January 1941.
47. THE AMERICAN CITY. "Municipal Fire Insurance." *American City* 57: 48-49; April 1942.
48. THE NATION'S SCHOOLS. "Insurance Rates in One State." *Nation's Schools* 22: 52; December 1938.
49. THE NATION'S SCHOOLS. "1000 School Fires." *Nation's Schools* 25: 70; March 1940.
50. VESTAL, R. S. *A Study of Fire and Tornado Insurance on Public School Property, with Special Reference to Texas Supervisory District Number Nine.* (Master's thesis.) Dallas, Texas: Southern Methodist University, 1941. Abstracted in *Abstracts of Theses, Master's Degrees in the Graduate School* 8: 35-36; 1941.
51. WERNER, JOHN C. "Litigation Concerning School Fire Insurance." *American School Board Journal* 90: 40-41, 58; December 1935.
52. WERNER, JOHN C. "What Price Fire Insurance." *Nation's Schools* 16: 50-51; December 1935.

CHAPTER XIII

Financial Aspects of the School Plant

WILLIAM R. FLESHER

In previous issues of the Review of Educational Research dealing with the school plant, reported research in the area of school finance has been limited largely to that dealing with school building costs. That the financial aspects of the school plant either merit more careful consideration or comprise a growing area of research, or both, is evidenced by the fact that in each succeeding cycle of the Review greater prominence has been given, in the issue devoted to the school plant, to a discussion of research in the field of school finance. In the first cycle, research on building costs was included as only a part of the chapter on school buildings (18). The issue on school plant in the second cycle confined research on building costs to the relation of type of construction and material to the original cost, maintenance, and operation of school buildings (22). In the third cycle an entire chapter was given to research on school building costs (6). The fourth cycle included not only a chapter on building costs (11) but also a short chapter on financing building by the sale of school bonds (5).

The plan of the present chapter, in this the fifth cycle, is to combine in one chapter research on school building costs and methods of financing school building construction. This combination and expansion, however, still exclude research on costs for maintenance, operation, and insurance of school plants and trends in construction costs due to changes in design or material.

Generally speaking, in the triennium since 1942, little true research in the area of school finance is evident from an examination of the literature. Especially is this true with respect to unit costs of building and division of costs among the major phases of school building construction.

The School Plant of the Nation

Table I, compiled by the author from the most recent statistics reported by the U. S. Office of Education (26), gives an over-all picture of the school plant in continental United States as of 1940 with comparative data for 1938. The Office of Education reported increases during the three-year period in the total value of the school plant and in the value per pupil enrolled. It reported small decreases in total public-school enrolment and number of school buildings, a larger decrease in the number of one-room school buildings, and a very marked decrease in the percent that capital outlay was of the total current expenditures.

TABLE I

Financial and Other Related Data Concerning the School Plant of Continental United States, 1940-42

Item	*1940*	*1942*	*Percent of Change*
Total public-school enrolment	$ 25,433,542	$ 24,562,473	−3.4
Value of public-school plant:			
Total	7,635,112,546	7,801,417,262	+2.2
Per pupil enrolled	300	318	+6.0
Number of school buildings	226,762	222,660	−1.8
Number of one-room school buildings	113,600	107,692	−5.2
Percent of annual expenditures spent for capital outlay*	11.0	5.9	−49.4

* Current expense, interest, and capital outlay; but excluding bond and short-term debt payments.

Extent and Cost of School Building

No research is needed to discover that school building construction in the last two years has been greatly curtailed by government restrictions on critical building materials. Table II, compiled by the author from *Bruce's School Market Letter* (7, 8), presents certain data on the extent and cost of building contracts let from January 1941 to July 31, 1944, as well as the school bond sales during that period.

TABLE II

School Bonds Sold and Contracts Let, 1941 to July 31, 1944

Year	*School Bond Sales*	*Contracts Let*		
		Number of Projects	*Square Feet*	*Value*
1941	$59,471,053	4,046	27,001,000	$151,195,000
1942	14,790,036	4,550	31,584,000	152,451,000
1943	13,220,369	2,973	16,043,000	56,758,000
1944*	15,801,800	2,138	6,728,000	48,667,000

* First seven months of 1944.

Some school building construction has taken place under provisions of the Lanham Act—Public Laws 137 and 409, enacted June 1941 and January 1942. This act provided for federal assistance to defense areas, including assistance for the construction, repair, equipment, and operation of school buildings. Alves (1) reported that by January 31, 1942, Presidential approval had been given to 276 applications for buildings under provisions of the Lanham Act. Edgar (9) found that the 290 applications given Presidential approval by March 1, 1942, under this act, called for a total expenditure of $42,913,113. Thurston (24) reported that by June 30, 1943, $142,000,000 had been spent on new buildings and remodelings under the Lanham Act.

Building Cost Indexes

Barker (4), using 1926 building costs as the base, computed that the building cost index for 1942 was 120.22, the highest in the period from

1926 to 1942, inclusive. He reported also that building cost indexes had been fairly constant (approximately 106) during the three-year period from 1937 to 1939 but had risen to 109.64 and 114.32 for 1940 and 1941. Indexes were lowest since 1926 in 1932 and 1933, being 76.2 and 79.9.

The psychological advantage and the financial error of voting bond issues and constructing buildings during periods of economic prosperity were pointed out by Hamon (16). Using 1913 as the base year and translating national capital-outlay figures into indexes, Hamon reported that the peak year of school building (capital-outlay index of 458.1) was 1925 when the construction cost index was 208, or only 43.2 below the highest construction cost index since 1913.

Unit Costs

Research on unit costs has been rather negligible. Holter (17) reported a cost of approximately thirty-four cents per cubic foot including the cost of equipment for a school plant completed in 1940. A Rhode Island high-school building was completed at a unit cost of forty-six cents per cubic foot including equipment, grading, and architect's fees (3).

Division of Costs

This is another area with a lack of research. Bits of data are available for individual cases. Fawcett (12), for example, reported the following percentage division of costs of three elementary-school buildings in Ohio in 1941: general construction, 71 percent; heating and ventilating, 15 percent; plumbing, 6 percent; electrical work, 8 percent. As a second example, an Ohio high school was reported (2) built with 74 percent of the total expenditures going for general construction, 15 percent for heating and ventilating, 5 percent for plumbing, and 6 percent for electrical work.

Methods of Financing School Plant Construction

Sale of school bonds continued as the major method of financing school building programs. *Bruce's School Market Letter* (7, 8) reported a marked decrease in the sale of school bonds since 1941. (See Table II.) The amount of school bonds sold during the first seven months of 1944, however, was greater than for either of the entire two years preceding. Grieder (15) pointed out that financing building by issuing bonds is very costly but predicted that its use would continue for some time, because state governments apparently are not yet ready to enter into the financing of school plant construction to a very marked degree. He pointed out further that very little research had been done and very little had been written concerning school bonds since 1935. He presented seven steps to be taken by boards of education and school administrators preliminary to submitting bond issues and gave ten principles to be followed in administering an approved school bond issue.

Flesher (13), in a study of support of financial proposals in Ohio from 1928 thru 1942, found that:

1. Sixty percent of the bond issues and 80 percent of the school levies submitted were approved.
2. The most favorable time for submitting bond issues was at special elections; the least favorable time at general elections.
3. School levies were given most favorable support at general elections and least favorable at primary elections.
4. Forty percent of the bond issues which failed to carry and were resubmitted in the same calendar year passed.
5. Approximately two-thirds of failing school levies passed on resubmission in the same calendar year.

Use of Federal Funds for Building

Alves (1) reported that as of January 31, 1942, of the 1141 applications for federal aid for school building under the Lanham Act, 569 had been given "certificates of necessity" by the Defense Publics Works Division of the Federal Works Agency. Of these 569, Presidential approval had been given to 287 applications. Edgar (9) stated that the approximately 290 approved applications called for the use of approximately $35,000,000 of federal money. Of the $142,000,000 spent by June 30, 1943, under the Lanham Act for new and remodeled buildings, Thurston (24) reported that $66,000,000 was federal money.

Joyal (19) stated that from 1933 to 1939 the Public Works Administration had assisted in the erection or alteration of 12,702 school buildings, for which $574,632,578 were allotted by PWA.

Publicity for School Financial Support

Edmiston and Holcomb (10) studied the number of column inches of newspaper publicity in connection with thirty-eight proposed bond issues submitted in Ohio cities from 1937 to 1939. They reported that:

1. Issues approved averaged more newspaper publicity than those which failed.
2. Editorials, practically a necessity for the success of an issue, were the most effective type of newspaper publicity.
3. When adverse publicity approached or equalled the amount of favorable publicity, the bond issue failed.
4. Accompanying bond issues lessened the chances of approval for the school issue.
5. To succeed on resubmission, even greater newspaper publicity was necessary.
6. Special elections were the best time to submit bond issues.

Shibler (23) reported the passage, by a 75 percent majority, of a special school levy which had failed the year previous by a vote of two to one. The technic used was to prepare alphabetized lists of voters, all of whom were contacted by parent-teacher association committees, and to hold six public meetings in addition to sending letters to parents.

School Building Needs

Fowlkes (14) reported that at least $5,000,000,000 would be needed after the war for the repair of old and the erection of new school buildings.

He based this estimate on the assumption that reorganization of local school units would be effected. The National Resources Planning Board (21) indicated that probably one-half the pupils below college grade are now housed in school buildings that are obsolete or poorly located. It predicted that there should be spent each year, for a five-year period, at least $1,860,000,000, to provide building sites and equipment for a justifiable minimum educational program for children below college grade.

Winston (27), in a study of needs for new elementary- and high-school buildings in thirty-six states, found a reported need in 1943 for 3199 new buildings and 2007 additions to buildings already constructed. The estimated cost of the new buildings was $321,076,013 for sites, buildings, and equipment, and $106,436,561 for additions. Thurston (25) predicted that $2,500,000,000 would be needed to catch up on school plant construction. He pointed out that the school district indebtedness in the two-year period ending in 1942 had decreased 8 percent in the United States.

Lewis (20) predicted that there will be need for federal assistance in school building programs in the postwar period. He pointed out, however, that the whole problem of federal support was dependent upon a sound economic system. He feared that the high national debt may cause opposition to increasing federal expenditures after the war.

Needed Research

When one considers the investment that the public has in the school plant of the nation and the amounts required annually for replacements and repairs, it is somewhat astounding that so little research on these phases of school finance has been carried on. The present period of limited building offers a splendid opportunity, and should provide an incentive for research in school building costs in order to make possible wiser school plant planning and execution of plans in the postwar period.

The greatest lack of research appears to be in the areas of unit costs and division of costs. Certainly there is need for research also on the interest costs of financing construction thru the sale of school bonds. A rather high percentage of the final cost of buildings financed in this manner, undoubtedly, goes for the payment of interest charges. Obviously this money could be spent to better advantage on other phases of the educational program.

Bibliography

1. ALVES, HENRY F. "School Facilities in Defense Areas." *Official Report, San Francisco Convention, February 21-26, 1942.* Washington, D. C.: American Association of School Administrators, 1942. p. 133-38.
2. AMERICAN SCHOOL BOARD JOURNAL. "Built for Culture and Community Education." *American School Board Journal* 103: 33-36; December 1941.
3. AMERICAN SCHOOL BOARD JOURNAL. "Gorton Junior-High School, Warwick, Rhode Island." *American School Board Journal* 105: 35-38; December 1942.
4. BARKER, HOWARD. "Are Your Buildings Insured for All They're Worth?" *School Executive* 62: 44-45, 52, 54-55; June 1943.

5. BOGLE, FRANK P. "Bonds to Finance School Buildings." *Review of Educational Research* 12: 221-23; April 1942.
6. BORMAN, HENRY H., and ENGELHARDT, NICKOLAUS L., JR. "Cost of School Buildings." *Review of Educational Research* 8: 408-12; October 1938.
7. BRUCE'S SCHOOL MARKET LETTER. "Pattern of 1943-44." *Bruce's School Market Letter* 64: 1-4; September 1943.
8. BRUCE'S SCHOOL MARKET LETTER. (Tabulated data unpublished as of October 1944.)
9. EDGAR, JAMES W. "Schools in War Production Areas." *Texas Outlook* 26: 13-15; May 1942.
10. EDMISTON, ROBERT W., and HOLCOMB, JAMES R. "Some Factors Favoring the Passage of School Bond Issues." *American School Board Journal* 104: 54; January 1942.
11. ENGELHARDT, NICKOLAUS L., JR. "Cost of School Buildings." *Review of Educational Research* 12: 224-27; April 1942.
12. FAWCETT, NOVICE G. "Grade Schools—Backbone of an American Community." *American School Board Journal* 105: 31-34; August 1942.
13. FLESHER, WILLIAM R. "The Voice of the Voters on School Financial Proposals in Ohio." *Ohio Schools* 21: 64-65, February; 122-23, March 1943.
14. FOWLKES, JOHN G. *Planning Schools for Tomorrow.* U. S. Office of Education, Leaflet No. 64. Washington, D. C.: Superintendent of Documents, Government Printing Office, 1942. 26 p.
15. GRIEDER, CALVIN. "School Bonding Policy." *American School Board Journal* 106: 41-42; January 1943.
16. HAMON, RAY L. "Planning Comes Now." *Nation's Schools* 30: 25-26; August 1942.
17. HOLTER, MILLARD M. "Wellston Enjoys a Balanced School Plant." *American School Board Journal* 107: 36-39, 58; July 1943.
18. HOLY, THOMAS C.; ARNOLD, WILLIAM E.; and ANDERSON, H. W. "School Buildings." *Review of Educational Research* 2: 370-86; December 1932.
19. JOYAL, ARNOLD E. "Still Another Step Toward Federal Control." *Nation's Schools* 29: 22-24; April 1942.
20. LEWIS, JOHN W. "Financing the School Plant of Tomorrow." *American School and University.* New York: American School Publishing Corp., 1944. p. 404-405.
21. NATIONAL RESOURCES PLANNING BOARD. *National Resources Development Report for 1943. Part I. Post-war Plan and Program.* Washington, D. C.: Superintendent of Documents, Government Printing Office, 1943. 81 p.
22. SCHERER, FRANCIS R. "Types of Construction and Materials as Related to the Original Cost, Maintenance, and Operation of School Buildings." *Review of Educational Research* 5: 383-87; October 1935.
23. SHIBLER, HERMAN L. "Voting That Extra School Levy." *Nation's Schools* 30: 15; August 1942.
24. THURSTON, LEE M. "Postwar School Plant Finance." *American School Board Journal* 108: 37-38; April 1944.
25. THURSTON, LEE M. "Postwar School Plant Finance." *Nation's Schools* 33: 31; March 1944.
26. U. S. OFFICE OF EDUCATION. "Statistics of State School Systems, 1939-40 and 1941-42." *Biennial Surveys of Education in the United States, 1938-40 and 1940-42,* Vol. II, Chapter III. Washington, D. C.: Superintendent of Documents, Government Printing Office, 1944.
27. WINSTON, ELLEN. *School Building Needs.* U. S. Office of Education, Leaflet No. 68. Washington, D. C.: Superintendent of Documents, Government Printing Office, 1943. 14 p.

CHAPTER XIV

Legal Aspects of the School Plant

JOHN H. HERRICK

THIS CHAPTER is designed to cover the literature dealing with the legal aspects of the acquisition, use, and disposition of school buildings, school grounds, and school plant equipment. There are, however, certain omissions that should be noted. A number of magazines, such as the *American School Board Journal*, publish regularly brief paragraph summaries of current court decisions, and others, such as the *Journal of Negro Education*, publish longer discussions of single cases. These are essentially news items. There are also numerous signed magazine articles dealing with one or more cases in a fashion that is primarily reportorial. There are undoubtedly research technics involved in preparing these materials for publication. However, the decision in a given case is so often dependent upon the statutes of the particular state or upon the particular facts of the case that the reporting of cases without generalization represents incomplete research and might properly be thought of as providing raw materials for research. These several types of articles are, therefore, generally omitted from this review.

The liability of the school district for its torts and those of its employees is the most discussed subject within the scope of this chapter, and there are many articles in the legal periodicals which deal in a general way with governmental tort liability. Since there is much material in the educational literature, the articles in legal publications are omitted unless they bear directly on school matters or bring out some aspects of the general subject not well covered in other sources. Anyone wishing to study fully the subject of school district liability will find it helpful to examine these general articles, all of which may be located under the topic of "torts" in the *Index to Legal Periodicals*.

While buses and other vehicles might be brought within a definition of school plant, the literature dealing with them has not been included in this chapter.

An outstanding event in this field in the past three years is the publication in 1943 of Volume 47 of *American Jurisprudence* (14), which includes a concise summary of the law on all phases of school operation. The generalizations are carefully stated and well documented, and this volume might well be the starting point for more detailed investigations of specific aspects of school law.

Nature of School Plant

As a general rule, the location of school houses is left to the discretion of the local board of education, altho there are in some states statutory restrictions as to surroundings or accessibility (14). Rockwell (19), in a study of school plant sanitation, found that eight states required approval

of the site by some agency other than the board of education and that five states had statutory restrictions as to type of site.

Rockwell (19) also discovered from his analysis of statutes that a majority of states require some approval of plans by an agency other than the board of education or the establishment by the state department of education of rules and regulations concerning plans and specifications for school buildings. Sanitary inspection of school plants and the correction of unsanitary conditions were also found to be required in most school codes, but mention of the purity of drinking water was found in the laws of only twelve states.

The power of boards of education to provide gymnasiums, athletic fields, and playgrounds has been upheld in many cases (10, 14), and the land used for athletic or play purposes need not be contiguous to the schoolhouse site (14). The right of the board of education to provide and operate school lunchrooms has been upheld (10, 14), and in some cases the authority has been implied from the power to control instruction (14).

The Research Division of the NEA (13) published brief summaries of cases in six states upholding the legality of public-school use of parochial school buildings, except that the ruling in Iowa was reversed in 1918. Rosenfield (21) referred to cases in nine states where such arrangements had been held unconstitutional, and to cases in Indiana and North Dakota where they had been upheld. The apparent contradiction between these authors is due to their use of different cases, altho the reader gets the impression by not unreasonable inference that each author had examined all pertinent decisions. The general rule, as stated by *American Jurisprudence* (14), is that the use of sectarian property is legal unless the arrangements are such that more or less religious instruction in the tenets of one denomination is necessarily involved.

In the absence of constitutional or statutory provision to the contrary, the general rule has been held to be that a board of education may not establish separate schools for white and colored pupils irrespective of the relative quality of instruction (14).

Oakes (14) stated that the construction of schoolhouses must usually conform to the requirements of city building codes or other valid police regulations.

Both Yakel (28) and Owen (15) reported that boards of education in Oklahoma have, under their authority to erect school buildings, an implied power to equip the buildings out of taxes levied for their construction. In Texas this general authority has been construed to authorize the erection of teacherages. It was also stated that the general rule is that boards of education have power to provide necessary apparatus and equipment, subject to statutory limitations (14).

Use of School Property

Several authors (2, 6, 10, 11, 14) summarized cases involving the use of school buildings for nonpublic school purposes. Great divergence of

opinion among courts in various jurisdictions was revealed in respect to the use of public-school property for private school purposes, for religious uses, and for entertainments and other community functions. Hamilton and Mort (10) and Oakes (14) observed in the court decisions a tendency toward liberality in the uses to which school property may be put. However, even where liberal use has been allowed, there must be no interference with the use of the property for regular school purposes (14). Chambers (5) reported that a California statute had been held to make it mandatory that school buildings in that state be made available as civic centers for use by various organizations.

Harrington (11) analyzed rules and regulations of boards of education as well as other legal materials, and found that local school authorities do not interpret very liberally the permissive statutes in respect to nonschool use of buildings. Local regulations often frown upon political meetings, dances, religious activities, and commercial or advertising uses. They are relatively liberal in allowing free use of school property to school organizations and other groups of educational character.

Financing the School Plant

Boards of education have no inherent power to levy taxes (10, 14, 15), nor can a grant of such power be implied from a statutory grant of authority to establish and maintain schools (10). The power of taxation is conferred upon boards of education by statute. In the exercise of this power, the procedures outlined in the statutes must be followed, altho the courts will usually overlook irregularties which are minor and which do not deprive the taxpayers of some substantial right (10).

A tax which has been approved by the voters cannot be extended to territory which has come into the school district subsequent to the election, if the constitution requires the consent of the voters to the tax. In the absence of such constitutional requirement, the tax may generally be extended to the added territory (14). The power of a board of education to borrow money is likewise acquired only by legislative enactment, and the provisions of statute are strictly construed (10). Debt limitations are absolute and cannot be evaded by any lease and option device (14). A lease with right of purchase is, however, legal if it does not constitute a purchase on the instalment plan in violation of a debt limitation (14). A contract in excess of the debt limitation is void, but it is enforceable up to the debt limit and invalid for the excess, whether the contract is severable or not (14).

Hamilton and Mort (10) reported lack of agreement among the courts as to what constitutes debt in interpreting debt limitations, and expressed the opinion that the better rule is that assets should not be deducted from the gross amount of debt. Accrued interest is debt, but future interest and contracts for future delivery of and payment for supplies as needed are not debt within the meaning of debt limitation statutes (14).

If bonds are invalid because of lack of authority to issue them, the bondholders may recover the unexpended portion of the money and any property purchased with the proceeds, if the property can be clearly identified as purchased from the proceeds of the bond sale and if its recovery will not seriously injure other property of the school district or disrupt the orderly management of the school (10).

The effect of boundary changes on the responsibility for unpaid debt is often governed by statute, and the legislature has plenary power in the matter (14). In the absence of statute, the general rule is that the debt remains on the original district, altho title may pass to the new district (10, 14). However, Oakes (14) pointed out some exceptions in instances where entire districts were merged.

Hamilton and Mort (10) reported cases in which statutes holding the remainder of a district liable for the payment of bonds were declared to be unconstitutional because they involved impairment of contract.

Taxation of School Property

Owen (15) reported two cases consistent with the general rule that public-school property is exempt from taxation by other subdivisions of the state, but is liable to assessments for paying and other improvements.

The Research Division of the NEA (13) published a compilation of the constitutional and statutory provisions regarding the exemption of private schools from taxation and stated that such exemptions were generally sanctioned by constitutional provisions. Witkowiak (27) reviewed two old decisions of the U. S. Supreme Court holding that such exemptions were contractual in nature and could not be abrogated by subsequent constitutional or statutory changes. Chambers (4) and Witkowiak (27) reported decisions holding that tax-exempt institutions are subject to pay taxes on property not actually and physically used for educational purposes.

Title to School Property

Johnston (12) pointed out that the ownership of school property, but not necessarily the title thereto, is in the state, and that the title to such property can vest in any person or persons designated by the state legislature to act as trustees. The legislature may transfer title without consent of the local school district, except that in so doing there must be no invalidation of contract in any trust that may be in effect (14).

In the absence of statutory restriction, a board of education may take title in fee simple (14). In case the property is taken by eminent domain, fee does not vest in the board of education, but only the right to occupy and use the property for school purposes is acquired (14).

Boards of education have a clear right to acquire property by eminent domain, including property for playground space, but in the absence of statute, property already devoted to public use may not be taken for school purposes (14). School property, on the other hand, may be taken for other public uses (14).

Edwards (8) and Oaks (14) discussed the general rule that reversion is not favored by the courts, and pointed out that the courts will construe a deed strictly against reversion unless the terms thereof unmistakably require it. Abandonment of a site acquired by eminent domain may result in reversion under the general rule that no fee but only the right to use and occupy the property is acquired by eminent domain (14). Property dedicated for school use will revert when the purposes of the dedication fail (14).

Edwards (8) stated that school district officers may not actually or in effect donate school property for a noneducational use, no matter how laudable the use may be. Thus the renting of a building for one dollar per year for hospital use was held to be illegal in an Arizona case (8).

The effect of a boundary change on the title to school property is often governed by statute, and the provisions vary from state to state (14). In the absence of statute, the common law rule, as generally held, is that the property becomes or remains that of the district in which it is located after the change in boundary (10, 14). However, Oakes (14) reported some authority in support of a contrary view to the effect that annexation gives the new district control of but not title to the school property.

Contracts

Three sources (7, 10, 14) emphasized that boards of education have no inherent power to contract, and pointed out that contracts entered into by a board of education must not only come within a statutory grant of power to make such contracts but must also conform to the manner and form prescribed by statute. The requirements of general contract law must also be observed (10, 15).

Irregular contracts may be ratified by a board of education by acting in a manner that indicates that ratification is intended, and such contract is binding (10). However, the use of improvements which cannot be removed, such as the remodeling of a building, does not constitute ratification (10).

Hamilton and Mort (10) analyzed the cases in regard to recovery under void contracts, and pointed out that the measure of recovery depends upon the type of contract. In the case of express contracts, the recovery is determined by the provisions of the contract itself. If the contract is implied in fact, the reasonable value of the goods furnished or services rendered determines the amount of recovery. If the contract is implied in law (quasi-contract), recovery is based on the amount of benefit conferred irrespective of market price or reasonable value. As a general rule, there can be no recovery from the board of education upon *quantum meruit* on a contract which is *ultra vires* (10, 14), and courts sometimes refuse to allow the board of education to recover payments already made on such contracts (10). Goods furnished under an *ultra vires* contract may be recovered if they can be removed without substantial injury to school district property

(10). Oakes (14) stated that public schoolhouses are generally not subject to mechanic's lien.

Rosenberg (20) pointed out some of the legal difficulties that a board of education may fall into during these times when boards of education may be compelled to purchase without a definite price, and urged that contracts for such purchase state with the utmost clarity and definiteness how the price is finally to be determined.

Insurance of School Buildings

Johnston (12) made a comprehensive and able study of the *Legal Aspects of Insuring Public School Property*, and in so doing analyzed the statutes and supreme court decisions of all of the states, the decisions of the U. S. Supreme Court, and the usual legal digests and encyclopedias. He found that twenty-one states have statutes requiring local school trustees to insure public-school property, and that eight states permit trustees to provide such insurance. In the remaining states, it was reported that the weight of authority seems to hold that school trustees have an implied power to insure school property. This latter is also the opinion expressed by Oakes (14).

It was found in Johnston's study (12) that two states specify by statute that property must be insured for its "insurable value," and in the remaining states the amount of insurance is left to the discretion of the local board of education. The school district, the building contractor, and material-men were all found to have an insurable interest in a building under construction, and the building contract may include provisions for such insurance.

Johnston (12) located no case in which the courts have specifically ruled on the personal liability of a schoolboard member in case of loss of uninsured property, but it was his conclusion, on the basis of extensive collateral evidence, that such personal liability would be sustained only in those jurisdictions where the statutes make it mandatory that school property be insured.

The courts were reported to have held that a district may insure in a mutual company if there is a limit on the contingent liability of the district, and that contracts lacking such a limitation are invalid (10, 12). Numerous constitutional objections to a state insurance fund covering all state property were reported (12) to have been rejected by the few courts before which such cases have been brought. The courts were found to have been consistent in holding that the proceeds of insurance constitute a special fund, which is exempt from attachment for debt, and which may be used only for repairing or rebuilding the damaged property. Johnston (12) found that insurance is not voided by reason of a vacancy clause when a building is not occupied during a usual vacation, but Oakes (14) stated that an extended vacation would void the insurance under such a clause.

Tort Liability

The subject of tort liability is closely related to school plant because most accidents resulting in suits for damages arise out of the use or misuse of school buildings, grounds, or equipment. Figures reported by Fuller (9) indicated that 8117 out of 9482 accidents in Los Angeles in one year occurred on school grounds or in school buildings.

Poe (17) published statistics showing that suits growing out of injuries to pupils are increasingly frequent. He stated that there had been 168 reported cases up to July 1, 1939, and that 138 of these had been reported after 1917. Rosenfield (25) stated that recent cases indicate that the focal points of trouble are faulty grounds and premises and insufficiency of supervision.

Tort liability in connection with the operation of schools is no different from tort liability in general, except for rather far-reaching exemptions. Where there is no immunity from suit, the alleged tort-feasor is not held liable unless he has deliberately or thru neglect inflicted injury upon another. The common defenses which may be used were summarized by Poe (17) and Rosenfield (25).

An important aspect of the subject of torts which is emphasized in both the educational and legal literature is that of the immunity of school authorities and employees from suit. The common law rule is that the board of education is not responsible for the torts of its employees (9, 14) and that the employee is responsible for his own torts. There are, however, exceptions. In Iowa, the employee is exempt from liability for his own negligence as long as he is acting within the scope of his employment (2, 16, 17). Rosenfield (23) reported that New York and New Jersey boards of education are authorized and required to reimburse an employee who is negligent and held liable, but later cases led him to conclude (22) that the New York law was meant to allow suit directly against the board of education rather than to give the employee the right of recovery from the board.

Statutes protecting teachers from suit in connection with school patrol activities in Minnesota, New Jersey, Pennsylvania, and Wisconsin were reported by Rosenfield (25). Poe (17) reported that California school districts are responsible for negligence of employees, while Fuller (9) placed California, New Jersey, New York, Washington, and, to a lesser extent, Connecticut, Minnesota, North Carolina, and Wisconsin in the same category.

Board of education members as individuals are generally not liable for tort either for their own acts in their corporate capacity or for the acts of their employees, altho they may be liable for failure to perform a ministerial duty or when guilty of fraud or false representation (14). Poe (17) reported that board of education members in California are individually liable for their own negligence.

The school district itself is generally held to be immune from suit for a variety of reasons which were summarized by Oakes (14), Hamilton and Mort (10), and others. Some exceptions to this rule have already been noted. New York districts are also responsible for accidents arising from defective equipment; Washington school districts are responsible for injuries to pupils except those growing out of the use of athletic equipment, playgrounds, field houses, manual training equipment, and parks; and California districts are responsible for any injuries resulting from a dangerous or defective condition of the school building, grounds, or equipment (17). Hamilton and Mort (10) reported that in some cases the district has been held responsible for the maintenance of a nuisance, the commission of trespass, and the infringement of patent.

The rule of immunity of school districts from liability has been harshly criticized by many writers. Repko (18) reported over two hundred articles in the law reviews alone since 1924. Fuller (9) reported actual cost figures for California and New York districts which, in his opinion, do not justify the widespread fear that admission of tort liability would lead to serious abuses. He also argued that liability would lead to greater care to avoid accidents, more prompt attention to injuries, and more frequent reprimand or dismissal of careless employees. Warp (26) presented similar evidence that liability does not lead to excessive cost or administrative abuse, and urged that the burden of accidents be borne by the entire community rather than the innocent individual who is the victim.

Chambers (3) found evidence of a "gradual softening of the harsh rule of immunity" but Rosenfield (24) judged the trend to be very slight. Hamilton and Mort (10), reporting on Wisconsin, observed a tendency for the legislature to extend liability and an equally noticeable tendency for the courts to restrict such legislation to very narrow limits. The almost unanimous opinion, according to Repko (18), is that a change must come thru legislation and not from the courts.

Poe (17) recommended an insurance system similar to workmen's compensation as a substitute for the present rule of immunity. Borchard (1) expressed the opinion that the country was not ready to accept such a theory of social insurance, and urged rather that the local community be required to assume more responsibility. Fuller (9) suggested, as a compromise between the present immunity and full liability, that legislation be enacted to permit recovery only for actual monetary damages resulting from tort, and to deny recovery for pain or suffering. He expressed the opinion that such a law would simplify litigation, avoid jury trials, promote prompt recovery, and limit the cost of administration.

Bibliography

1. BORCHARD, EDWIN. "Proposed State and Local Statutes Improving Public Liability in Tort." *Law and Contemporary Problems* 9: 282-310; Spring 1942.
2. BURNS, EDITH H. "School District Responsibility for Injuries to Pupils." *Brooklyn Law Review* 12: 64-70; October 1942.

3. CHAMBERS, MERRITT M. "Can the King Do Wrong?" *Nation's Schools* 29: 56, 58; April 1942.
4. CHAMBERS, MERRITT M. "Colleges and Universities." *Tenth Yearbook of School Law.* Washington, D. C.: American Council on Education, 1942. p. 139-51.
5. CHAMBERS, MERRITT M. "When the Public Uses Schools for Civic and Welfare Purposes." *Nation's Schools* 29: 30-31; June 1942.
6. COOKE, DENNIS H., and ANDERSON, HOLGER W. "Public Taxes for Private Schools." *American School Board Journal* 104: 26-27; February 1942.
7. DAY, JAMES W. "School Contracts Other Than for Teaching." *Tenth Yearbook of School Law.* Washington, D. C.: American Council on Education, 1942. p. 69-75.
8. EDWARDS, NEWTON. "Public School Property." *Tenth Yearbook of School Law.* Washington, D. C.: American Council on Education, 1942. p. 65-68.
9. FULLER, EDGAR. "Liability for Negligence of Educational Officers and Employees." *American School Board Journal* 103: 29-30, October; 23-25, November; 27-28, 63, December 1941.
10. HAMILTON, ROBERT R., and MORT, PAUL R. *The Law and Public Education.* Chicago: Foundation Press, 1941. 579 p.
11. HARRINGTON, ELEANOR M. *Non-School Use of Public School Property—Its Legal Basis.* New York: Fordham University, 1940. 524 p. (Doctor's thesis.)
12. JOHNSTON, ROBERT W. *Legal Aspects of Insuring School Property.* Nashville, Tenn.: George Peabody College for Teachers, 1943. 270 p. (Doctor's thesis.)
13. NATIONAL EDUCATION ASSOCIATION, RESEARCH DIVISION. *State Aid to Private Schools.* Washington, D. C.: the Association, 1943. 34 p. (Mimeo.)
14. OAKES, EDWIN S., and OTHERS, editors. "Schools." *American Jurisprudence,* Vol. 47. Rochester, N. Y.: Lawyers Cooperative Publishing Co., 1943. p. 296-464.
15. OWEN, RALPH D. "School District Indebtedness." *Tenth Yearbook of School Law.* Washington, D. C.: American Council on Education, 1942. p. 86-96.
16. POE, ARTHUR C. "Liability and the Physical Educator." *Journal of Health and Physical Education* 12: 404-405, 436-37; September 1941.
17. POE, ARTHUR C. *School Liability for Injuries to Pupils.* Contributions to Education, No. 828. New York: Teachers College, Columbia University, 1941. 108 p.
18. REPKO, JOHN S. "American Legal Commentary on the Doctrines of Municipal Tort Liability." *Law and Contemporary Problems* 9: 210-33; Spring 1942.
19. ROCKWELL, GERALD P. *The Legal Status of School Plant Sanitation in the United States in 1940.* Columbus: Ohio State University, 1940. 152 p. (Master's thesis.)
20. ROSENBERG, CHARLES R., JR. "When School Boards Must Buy Without a Price." *American School Board Journal* 103: 25-26, 63; December 1941.
21. ROSENFIELD, HARRY N. "Cooperation Between Local Public and Parochial Schools." *Nation's Schools* 31: 23-24; February 1943.
22. ROSENFIELD, HARRY N. "Liability for Accidents; a Review of School Cases in 1942." *Nation's Schools* 31: 27-28; April 1943.
23. ROSENFIELD, HARRY N. "Liability for School Accidents in Health Education." *Harvard Educational Review* 12: 64-75; January 1942.
24. ROSENFIELD, HARRY N. "Recent Trends in Liability Decisions." *Journal of Health and Physical Education* 13: 232-33, 260-62; April 1942.
25. ROSENFIELD, HARRY N. "Some Recent Court Decisions on Legal Liability of Teachers." *Journal of Health and Physical Education* 12: 366-67; June 1941.
26. WARP, GEORGE A. "Law and Administration of Municipal Tort Liability." *Virginia Law Review* 28: 360-85; January 1942.
27. WITKOWIAK, STANISLAW B. *Limitations Imposed Upon the Rights and Powers of Respective States over Education by the United States Supreme Court.* Washington: Catholic University of America Press, 1942. 174 p. (Doctor's thesis.)
28. YAKEL, RALPH. "Taxation for Public Education." *Tenth Yearbook of School Law.* Washington, D. C.: American Council on Education, 1942. p. 97-107.

Index to Volume XV, Number 1

Page citations are made to single pages; these are often the beginning of a chapter, section, or running discussion dealing with the topic.

Accidents, 88
Acoustics, 55
Analysis of social needs, 6
Architects, 55, 58
Art rooms, college, 36
Atmospheric quality, 51

Boiler efficiency, 38
Bonded debt, 79
Bonds, 78, 79; legal aspects, 86
Building cost indexes, 78
Buildings. *See* School plants.
Burned buildings, replacement, 25
Business education, equipment, 29

Campaign for school support, 80
Campus plans, 34
Capital outlays, extent, 78; federal support, 24; legal aspects, 85
Classroom design, 15, 56
Classrooms, college, 34
Codes, building, 59
Colleges, plant facilities, 34
Color, and lighting, 43
Community centers, 7
Community Facilities Act, 24
Community use of school plant, 8
Contracts, for school plants, 87
Cooperative planning, 21
Costs, school plant, 77, 78; unit, 79
Custodial personnel, 61
Custodians, dress, 63; relations with teachers and pupils, 66; salaries, 62; training, 61; work schedule, 62

Debt limitations for school plant, 85
Decorating, 65
Democratic planning, 18
Depreciation, 73
Design, trends, 56
Dormitories, college, 37

Elementary schools, 13
Equipment, lighting, 48; mechanical, 66; needs, 26; vocational education, 29

Federal control of education, 25
Federal funds for building, 80
Federal support for school plant, 24
Federal Works Agency, 24

Fire insurance, 71
Fire losses, 71
Fire prevention, 65
Floors, maintenance, 64
Functional planning, 13

Gymnasiums, 64

Health facilities, college, 37
Heating, 51, 55
Higher education, plant facilities, 34
Home economics, equipment, 30
Housekeeping, 63

Industrial education, equipment, 30
Insurance, legal aspects, 88; liability, 90; school plants, 71
Insurance programs, administration, 72

Janitors. *See* Custodians.
Junior college, plant facilities, 39

Laboratories, college, 35
Lanham Act, 24, 80
Legal aspects of school plants, 83
Liability, 83, 88
Libraries, college, 35
Lighting, 41; brightness and glare, 43; fluorescent, 47, 56; present status, 41; shop, 31; trends, 41

Maintenance, of floors, 64; roofs and walls, 65
Materials, trends, 54
Music rooms, college, 36

Need, determination of, 10
Needed research, in plant costs, 81; on school plant, 8
Needs, equipment, 26; school plant, 80

Office equipment, 29
Operation of school plant, 61

Painting, 65
Personnel, custodial, 61
Physical education, college plant facilities, 36
Plastics, 55
Playgrounds. *See* Sites.

Plywood, 55
Postwar, school plants, 57
Prefabrication, 58
Property, legal use, 84
Publicity and school support, 80
Public relations, 20

Residence halls, college, 37
Restrictions, wartime, 26
Roofs, maintenance, 65

Safety, 65
School plants, availability, 7; codes, 59; construction, 58; costs, 78; financial aspects, 77; financial restrictions, 85; flexibility, 59; insurance, 71; junior college, 39; legal nature, 83; legal ownership, 86; needs, 10, 11, 24; planning, 13; postwar, 57; social implications, 6; temporary, 58; value, 77; wartime needs, 27
Score cards, for college buildings, 34
Secondary schools, 14
Sites, area, 6
Social significance of school plant, 6
Special rooms, 14
Staff participation in planning, 20
State insurance systems, 73
State regulations, 59
Surveys, school plant, 10
Swimming pool, 21

Taxation, for school plant, 80
Teacher training, plant facilities, 38
Temporary buildings, 25
Theaters, college, 36
Thermal balance, 51
Torts, 88

Unit costs, 79

Value of school plants, 77
Ventilation, 51
Visual aids, facilities for, 15
Vocational education, plant facilities, 29

Wartime needs, 24
Work schedule, for custodians, 62